The Builder.

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Machinery for Joiners' Work.—The Redcliffe Estate, Brompton.

E propose to devote this page to a little bit of advertising, but it is advertising with a view to what seems to us public advantage. We want to make better known what can really be done in one branch of building by means of machinery than it is at present. It would seem curious, if we did not know how often a new thing must be said before it is heard and acted on, to find that even at the present time some of our leading builders, each paying hundreds of pounds weekly for joiners' wages, shut their eyes to the enormous economy that can be effected in this class of work by the employment of some of the machines which have been perfected within the last few years. It seems a general idea among builders, even among those who admit the saving effected by machinery for joiners' work, that machinery can pay only in very large establishments, and that unless a builder can afford to expend a great sum of money upon an extensive plant, and have separate machines for each operation, he had better be without machinery altogether. Our inquiries, however, lead us to the belief that by a moderate outlay on machinery, which would be within the means of any man employing a dozen men, a great saving may be effected. Desiring by all means to lessen the cost of houses, and knowing very well that machinery benefits in the long run even those who may seem for a time to be injuriously affected by it, we have looked more carefully into the subject, and will give some of the results. These are taken from the accounts kept of the work actually turned out by a small plant of machinery erected by Samuel Worssam & Co., of Chelsea, for Messrs. Corbett & McClymont, who are building largely upon the Redcliffe Estate, West Brompton. And first let us say a few words about the rather remarkable building operations that are being carried on here.

The Redcliffe Estate, which is something less than two miles from Hyde Park-corner, consists of about seventy acres. The Fulham-road bounds it on the south side; the Old Richmond-road, leading from South Kensington to Hammersmith, on the north side; Honey-lane, leading from the Fulham-road to the Richmond-road, forms its western termination; and The Grove, Boltons, and Redcliffe-road, are its bounds on the east side. Not five years ago the whole of this estate was used as market garden-ground. A considerable portion of it belongs to Capt. Gunter and Capt. James Gunter, Messrs. G. & H. Godwin acting as their architects. For the freeholder of another part of the estate Messrs. C. Lee & Son are the architects.

When Messrs. Corbett & McClymont first went on to the land there was no carriage-road from Fulham-road to Richmond-road, but they have now made a handsome road, called Redcliffe-gardens, upwards of 60 ft. in width, and about half a mile in length (on the site of Walnut-tree-walk), on either side of which very capital semi-detached villas are being erected. Near the north end of Redcliffe-gardens a square has been formed, through which Redcliffe-gardens pass, and in the western half of the square a site has been set aside for a church. The builders have carried out their operations with great spirit and activity; they have constructed the whole of the roads and sewers, and there are now erected on the estate, standing upon a bed of gravel and sand for upwards of 20 ft. in depth, about 550 houses, shops, and stables. The houses have been built with a view apparently to suit a variety of tenants, as the rents commence at 50*l*., and range from that amount up to 160*l*. per annum. About 400 more houses, we learn, are yet to be erected, many of them of large size. With a good service of omnibuses, and two railway-stations, viz., the Chelsea Station, at the south end of the estate, and the West Brompton Station, at the north end of the estate, which afford ready communication with the City, this district can scarcely fail to come into good use, and give a good reward to the builders for their enterprise and skill.

To return, however, to our subject. The whole of the joiners' work for the houses on this estate is prepared from deals and battens, which are purchased at the docks, and stacked in the yard adjoining the mill until seasoned.

The machinery is fixed in a temporary building on a convenient part of the land, and comprises:—

1. A Worssam's portable deal frame, capable of sawing at one time two deals or planks, up to 14 in. wide by 4 in. thick, into boards of any required thickness. This machine is so constructed as to require no excavations below the floor, often inconvenient. It is entirely self-contained, being all fitted to a strong cast-iron foundation plate. The swing frame being made of steel, it combines great strength with lightness, and can be driven at the rate of 250 strokes per minute with twelve saws working at once without perceptible vibration. The saws used in this frame are very thin, so as to reduce the waste of wood to the minimum.

2. A self-acting saw-bench with a feed motion by means of a rope for bringing forward the timber to the saw. The rate of feed, it seems, can be varied from 12 ft. to 60 ft. a minute, according to the nature of the work. This bench is used chiefly for sawing single cuts in deals, planks, or battens; for cutting feather-edged boards or ripping out scantlings of various sizes; and it is provided with a pair of timber-carriages or "bogies" running on rails for carrying the ends of a long piece of timber.

3. There is a planing and "trying up" machine for planing and "trueing up" the stuff after it leaves the sawing-machines. This, they say, is the only machine which has ever been brought out which will set a piece of twisted timber true, and at the same time give it a planed face fit for glueing up without requiring to be touched by a hand-plane. The stuff to be planed is laid upon a planed travelling-table of cast-iron, and is held by a series of screw cramps, which retain it in one position when under the action of the cutters. It is worked by a labourer at 24*s*. a week, and some notion may be formed of the economy effected by the use of this machine when it is mentioned that it will plane up the whole of the stuff for fifty 2-in. doors in ten hours. The work performed by it in our presence seemed very good.

4. The "General Joiner" is a singularly useful machine, which appears to do almost all the different kinds of work usually executed by hand in a joiner's shop, amongst which may be reckoned sawing, planing and thicknessing, mortising, tenoning (single or double), cross-cutting and squaring up, grooving, tongueing, rebating, moulding and beading, chamfering, wedge-cutting, boring, and a great variety of other operations. With a little practice any joiner can work it. The mortising apparatus is fitted with a self-acting feed motion, by means of which the piece being mortised is moved forward at each stroke of the hand lever. The table is fitted with stops which regulate the depth and length of the mortises, and the bed has an independent rising and falling motion, so that a lad can be mortising or boring while a man is at work at the other table. The mortising apparatus is usually worked by a young lad, who will make from sixty to eighty ordinary mortises in an hour.

After the stuff has been planed at the trying-up machine, it is taken to the "general joiner," at which it is mortised, tenoned, grooved, moulded, and otherwise prepared for putting together and cleaning off in the joiners' shop.

All these machines, in full work, are driven by a Ransome's 12-horse power portable steam-engine. The fire-place is of extra size, to enable it to use up the sawdust and waste wood from the different machines, which, mixed with a little small coal, is found sufficient to generate an ample supply of steam. The road-wheels and axles of the engine are removed, and the boiler is set upon two cast-iron saddles: by this arrangement all oscillation is avoided, and it becomes as it were a stationary engine, with a quick draught, occupying a very small space. The smoke from this engine is not much more than that from an ordinary house chimney, and it works almost noiselessly.

Of course there is a grinding apparatus for grinding and setting the plane-irons, and a moulding-iron grinder, with small Bilston stones of various forms for sharpening moulding-irons; and in order to keep the grit and sludge from the grinding machines from spoiling the other machinery, the former are fixed in a small "lean-to," built out from the main building.

The whole of the machinery is driven from a single line of main shafting which runs across the mill. This shafting, we observe, is fixed below the floor in a tunnel, and thus all the driving-bands are kept out of the way, which is a great advantage where long pieces of timber are being constantly carried about, and where, consequently, overhead driving gear would be dangerous. All the machines are placed on stones, set on a few courses of brickwork: being thus solidly fixed, they can be driven at a very high speed without vibration; and being entirely independent of the building, a light cheap erection to keep out the weather is all that is required.

The entire cost of the plant in the shop we are describing, including steam-engine, shafting, bands, and a complete set of saws and cutters for each machine, was 1,000*l*., including fixing and starting it to work. Of this sum one-half may fairly be taken as chargeable to the *sawing* department, leaving the cost of the *joiner's* machinery with its proportionate share of the engine and shafting at 500*l*.

And now comes the question of saving. The net earnings of the deal-frame and self-acting saw-bench, estimated from the prices charged for cutting at the mills, have averaged, we are assured, 72*l*. per month, after deducting all working expenses. This result has been obtained from the books of the mill, dating back from the time when the machinery was first started, about six months since.

The following facts will illustrate the saving

of labour effected by the Trying-up Machine and the "General Joiner":—

Cost of Labour upon Thirty 2-in. Four-panel Doors, 6 ft. 10 in. by 2 ft. 10 in.

	£	s.	d.
Planing and trueing up the whole of the stuff, and planing and thicknessing the panels. Man's time at trying-up machine, 7 hours	0	3	2
Mortising, tenoning, grooving, and otherwise preparing the work ready for putting together at the 'General Joiner,' two lads ten hours each	0	4	2
Half the time of the foreman of the mill setting out the work and adjusting the cutters, &c., five hours	0	3	6
Total cost of labour at the machines	0	10	10
Putting together, wedging, and glueing up and cleaning off by hand, but not including moulding, 76½ hours at 6d. per hour	1	18	3
Total cost for labour on thirty 2-in. doors	£2	9	1

Total cost for labour on one 2-in. door, equal to 1s. 7d.

Cost of Labour upon 36 Pairs of Sashes, 7 ft. by 4 ft., with four Panes.

Planing and trueing up the whole of the stuff. Man's time at the trying-up machine, five hours	0	2	2½
Mortising, tenoning, moulding, and rebatings, scribing, sticking the sash bars, &c., at the 'General Joiner.' Two lads ten hours each	0	4	2
Half the foreman's time setting out the work, and adjusting the cutters for the lads at the 'General Joiner,' five hours	0	3	6
Total cost of labour at machines	0	9	10½
Putting together, wedging, and glueing up and cleaning off after leaving the machines, sixty hours at 6d. per hour	1	10	0
Total cost for labour on thirty-six pairs of sashes	£1	19	10½

The total cost for labour on one pair of sashes, equal to 1s. 8d.

Cost of Labour upon 28 Sash Frames for 7 ft. by 4 ft. Sashes, including the Sills.

Planing up the whole of the stuff for twenty-eight sash frames. Man's time at trying-up machine, five hours	0	2	2½
Sticking parting beads, grooving the pulley stiles for parting bead, cross-tonguing and sinking heads of pulley stiles, bevilling, grooving, and sinking sills, and trenching to receive pulley stiles, at the 'General Joiner;' two lads ten hours each	0	4	2
Half the foreman's time setting out the work, and adjusting the cutters for the lads at the 'General Joiner,' five hours	0	3	6
Total cost of labour at the machines	0	9	10½
Putting together and cleaning off by hand after leaving the machines, fifty-six hours at 6d.	1	8	0
Total cost for labour on twenty-eight frames	£1	17	10½

The total cost for labour on one frame, equal to 1s. 4d.

In all the above instances the stuff was sawn to the right *thickness* at the deal frame and saw-bench, and cross cut to lengths; but the ripping out was done at the "General Joiner," the cost being included in the above figures. Interest on the cost of the machinery would have to be added, together with a proportion of the engine-man's wages; but this would give but a very small increase to the cost of the items in question. We believe that a section of our readers will find it worth while to inquire for themselves into the correctness of these details.

We saw at the manufacturers' some specimens of the higher kinds of joiners' work, such as circular sashes and embossed and sunk ornamental panels, such as, it has hitherto been considered, could not be done by machinery, but which, in reality, are produced by a newly-invented machine at less than one-fortieth part of the cost of hand labour; but into this part of the subject we will not now enter, confining ourselves to the results of the plant set up for one particular firm of builders.

TECHNICAL INSTRUCTION FOR ARTISANS.—At a conference on this subject at the Society of Arts, arranged by the Working Men's Club and Institute Union, a committee was appointed to ascertain how far existing institutions may be rendered available as industrial museums and trade colleges in London, to be set on foot on the principle of combining voluntary effort with aid from the State; to ascertain in what district of London such colleges and museums may best be established; to communicate with employers and manufacturers on the subject of providing technical instruction in the workshops; and to take such further steps as the committee may think desirable with reference to the object in view.

ON THE UTILIZATION OF SEWAGE BY IRRIGATION.*

IT has already been demonstrated that in pouring the impure contents of our sewers into the nearest water-courses, we are not only imperilling the health of the community in more ways than one, but we are wasting, to produce this baneful effect, a commodity of inestimable value to our fields. That such is the case is due partly to the looseness of the laws referring to the pollution of rivers; partly to the narrow policy of private manufacturers, who in many cases, from ignorance or want of energy, will take no means to rescue ingredients of considerable worth, such as are now aiding in the discolouration of our streams; and partly—perhaps chiefly—to the apathy of the great body of the public, which, ever slow to the appreciation of a nuisance which has been of a gradual and insidious growth, has at the same time no just idea of the benefit which would accrue from the application of sewage to the land. That this benefit would be solid and permanent, is a truth which cannot fail to be extracted from the great mass of evidence which has from time to time been placed before the nation, and it is now our duty to give a sort of digest of this evidence, which, however crude and incomplete, at any rate may claim to possess the merit of being faithful. In this statement it is proposed to include an analysis of the principles of sewage irrigation; its estimated benefits to the country; a careful examination into its different methods of application; its comparative merits under the combined and separate systems of drainage; the nature of the land and the crops concerned in its application; the sanitary effects; and its practical results as recorded in the most eminent examples.

Comparative Novelty of Sewage Irrigation in this Country.

When the word novelty is used in reference to the cultivation of land by sewage, it is to be understood that, although in one or two isolated cases—such as Edinburgh, where we are credibly informed † that even from so far back as two centuries ago, sewage has been applied to the soil—it is only within recent times that it has been reduced to an organised system.

On the other hand, in the southern parts of Europe, the principles and practice of this important branch of agricultural science have long since attained considerable perfection, evidence of which may be derived from the numerous and costly works which have been profitably constructed in the vicinity of large towns. And, as has already been said, in all hot and dry countries in every part of the globe, water irrigation has from the remotest ages supplemented the forces of nature. For this purpose, we are told that systems of reservoirs, similar to those of our modern waterworks, were constructed by the engineers of ancient India, Assyria, and Egypt, on a scale of magnitude corresponding with the powerful grandeur of those nations. The *noria* of the Moors, the bucket-wheel of the Persian, and the *fadouf* or rude water-lever of the Egyptians, were appliances used in irrigation for raising the water to the desired height, and are still to be seen in those countries.

In Spain, where this art was carried to perfection under the enlightened dominion of the Moors, schemes of irrigation at the present day form a most important branch of public and private enterprise, some of which are in the hands of English engineers. These works do not resemble the river-warpings which have from a very ancient date been practised in this country, more particularly upon the banks of the Ouse, in Yorkshire, but rather those river-meadows such as in Devonshire illustrate the value of a large and regular supply of water on a free and well-drained soil.

To the humidity of our climate, and consequent abundance of water, is due the rarity of irrigation works in this country; and to this it may be added, that until very recently, the defective drainage of cultivated lands prohibited anything like irrigation on a large scale, where such works were feasible and most to be desired. Now, however, that good drainage has become general, and the soil rendered dry and porous, and capable of absorbing additional moisture, the latter drawback no longer exists, and it is generally admitted that light and well-worked soils are adapted for irrigation under ordinary circumstances. Experience also has demonstrated that the moisture of our climate is so far from marring the effect of irrigation, that enormous quantities of water or sewage may be applied with the happiest results.

It has been computed that the annual depth of sewage applied to the Craigentinney meadows, Edinburgh, which bring a rental of from 15*l.* to 20*l.* per acre, is not less than 64 in., and this under a climate far more humid than that of England generally.*

Analysis of the Principles of Sewage Irrigation.

In treating of this section of our subject, we must consider, firstly, the elements of vegetable growth; secondly, the form in which such elements are best applied to the plant; and thirdly, whether, in matter and in form, the sewage of towns comprehends those qualities essential to application and increase. Although the diversity of the combination of the elementary constituents of plants is almost infinite, yet these constituents are actually reducible to four, namely, oxygen, hydrogen, carbon, and azote or nitrogen. From these elements are derived, through the medium of chemical combination, certain compound constituents, some of which are combustible, and some of which are incombustible. The latter, which are simply the ash which all vegetable substances leave on combustion, are chiefly phosphoric, sulphuric, and silicic acid, potash, soda, lime, iron, magnesia, and chloride of sodium. The former are derived from carbonic acid, ammonia, sulphuric acid, and water. These, whence we have the ammonia, starch, sugar, gum, and other substances composing the fabric of a plant, are in point of fact the food which is supplied to it by the decomposition of the atoms of manure in which its roots are embedded, so that to a certain extent, the medium which is calculated to effect most speedily and completely such decomposition must be productive of most benefit. Now it is a well-known fact that no manure, be it what it may, is freed from the enriching elements it may contain without the intervention of moisture. For the roots of plants to absorb their food in a dry state is an impossibility; therefore, until a shower of rain or some other watery agent has decomposed the sources of fertility, an application of manure is of no benefit. Cowley has said:—

> "The plants suck in the earth, and are
> By constant drinking fresh and fair;"

and it would be difficult to find a more fitting expression in which to convey a definition of the process of their growth. Liebig says: "The presence of moisture, a certain degree of heat, and free access of air are the proximate conditions of those changes by which the nutritive substances in chemical combination are made available for the roots. A certain quantity of water is indispensable to transpose the soil constituents when rendered soluble; water, with the co-operation of carbonic acid, decomposes the silicates, and makes the undissolved phosphates soluble and diffusible through the soil."† Again: "*Dung and other manuring agents act only through the medium of the earthy particles that have become saturated with the nutritive substances contained in the manure.*" ‡

If, therefore, we can discover a manure which, while it contains the elements of fertility, contains them in that form which most readily assimilates them to the structure of the plant,—the form of solution,—it will be admitted that, provided the application of such a manure be commercially practicable, it must be productive of immense benefit to the country. From the analyses and opinions of our most enlightened chemists and practical agriculturists, we have shown that the sewage of cities is rich in manurial properties, the greater part of which are held in solution, and are thereby most available for vegetable increase. And we shall hereafter place before the reader proof that its application in such form is consistent with the most satisfactory pecuniary results.

The chairman of the Metropolitan Board of Works is of opinion that the application of sewage in a liquid form is the best. §

Sir Charles Fox says that sewage can be remuneratively applied in a liquid form only. ‖

The Rivers Pollution Commissioners, speaking with reference to the application of town sewage to land, say in their third report (Aire and

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* See. pp. 146 and 168, *ante*.
† Rep. Met. Sewage, 1864: 4104.

* Rep. Met. Sewage: 4973.
† Natural Laws of Husbandry, p. 75.
‡ Natural Laws of Husbandry, p. 145.
§ Rep. Met. Sewage, 1864: 222.
‖ Rep. Met. Sewage, 1864: 1236.

Calder rivers), that "the produce of properly irrigated land will be from five to ten-fold that of the same land under ordinary cultivation." The Commissioners also state that, in the course of their inspection of the Aire and Calder district, they had no experience of any town or locality where the application of sewage irrigation would be impracticable.*

Professor Way considers that the liquid form is the only proper form of dealing with sewage.†

Mr. R. Rawlinson thinks the best mode of dealing with sewage in all cases is to carry it rapidly on to the land.‡

The Report of the Commissioners on Metropolis Sewage, 1864, states,—"Your committee have come to the conclusion that it is not only possible to utilize the sewage of towns, by conveying it in a liquid state through mains and pipes into the country, but that such an undertaking may be made to result in pecuniary benefit to the ratepayers of the town whose sewage is thus utilized." "That soils and the roots of growing plants have a great and rapid power of abstracting impurities from sewage-water, and rendering it again innocuous and free from contamination." And, "That if it is no longer to flow into rivers, the only alternative which remains is to dispose of it on the land."§

The Different Methods of Sewage Irrigation.

Having described the principles of the action of sewage upon the soil, we will now proceed to a brief account of the various modes of its application. These are as follow:—

1. By bed and catch-work from open conduits.
2. By hose and jet distribution from iron pipes.
3. By flat-flooding or submersion.
4. By sub-irrigation.

1. *Bed and Catch-work.*

So far as our present experience extends, there can be little doubt that this method of applying diluted liquid manure is by far the most successful, and its extreme simplicity as compared with other modes would appear to mark this as a natural result. Bed-work is adopted generally in preference to catch-work, but this arises chiefly from the fact that where irrigation is being carried on the configuration of the ground is more generally adapted to the former method. In the selection of a site for an irrigation farm, the level or gently rising meadows on the banks of a stream below the outfall are considered as the most favourable to the principle of gravitation; preference being always given to ground with a double inclination,—that is, with a slope perpendicular to, as well as parallel with, the stream. When these slopes are sufficiently moderate, or when the ground is level, the following is the system of preparing it by bed-work. The sewage, after being strained, by means of a very simple and effective grating, from those grosser impurities which would impede the easy flow of the liquid over the soil, is brought to the highest point in the field, in a spacious open conduit; thence it is conveyed across the head of the enclosure, maintaining its superior elevation. The surface of the field is divided into parallel beds of the width of from 30 ft. to 40 ft., running perpendicularly to the conduit. These beds are carefully arranged on the ridge and hollow plan, so that they present a series of gentle declinations, falling away on both sides from the centre of each ridge, which is longitudinally intersected by a narrow gutter a few inches deep. Communication is effected between these gutters or feeding canals and the main conduit by means of little stop-gates, which, being removed, allow the feeders to be filled, and to shed their overflowing contents in a gentle, constant stratum, in and about the roots of the plant, which absorb the properties in solution through the digestive medium of the soil. The action of the latter, thus quickened by the transforming process of vegetable growth, tends effectually to clarify the liquid, which drains off in a comparatively pure state.

In the centre of each hollow, between the beds, is laid a shallow drain of just sufficient depth to receive and carry off without reference to subsoil drainage, the clarified water after irrigation. In some cases it is deemed necessary to pass this once more over the soil. By these minor drains the liquid is carried into a large intercepting drain at the bottom of the field, which, taking the general inclination of the valley, may be brought to the surface at a lower level, and its contents once more utilized. The completeness with which this plan is carried out is a striking feature in the irrigation works at South Norwood.

In water irrigation, open receiving-canals are often substituted for shallow drains, into which the liquid is drained off, percolating to the root-fibres; but this method cannot be considered as adapted for the treatment of sewage. When, as often happens, the inclination of the ground in the direction of the feeding-canals is too great to admit of their being filled to one level throughout, it becomes necessary to ensure a uniform distribution of the sewage by dividing them into level reaches with sudden drops, as in ordinary canals. This is effected by the simple expedient of wooden slops or sods of turf, which may be put down or taken up at will, and between which the sewage overflows equally on both sides. In order to receive the highest benefit from the utilisation of sewage in this mode, it is requisite that the land selected should be naturally free and porous, well drained and pulverized, so as to render it thoroughly absorbent and to avoid stagnation, the bane of irrigation. Beneath the surface-drains specially laid to collect the purified sewage-water, a perfect system of irrigation demands efficient deep drainage of the usual kind; otherwise, unless the soil happens to be unusually dry, it will tend to become water-logged and soddened: this, of course, should be the first operation. The quickest method of making the small feeding-canals is to run the plough along the ridge of each bed, taking a tolerably deep furrow; after which, a labourer with his spade can finish them off with great facility.

Messrs. Napier & Hope, in their scheme for the utilization of the northern sewage of London on the Maplin Sands, have proposed to line their feeding-canals with clay tiles having a double lip; this lip extending 2 in. or 3 in. over the ridge on either side.* This is with a design to prevent the supposed nuisance arising from the accumulation of decomposing solid matter upon the "ragged edges" of ordinary feeders,—a supposition wholly inconsistent with the fact. In Messrs. Napier & Hope's scheme, as laid before the Metropolitan Board of Works, no provision appears to have been made for straining or settling the solider portions of sewage prior to conducting it upon the land. In this case it would be doubtless necessary to adopt tiles of the kind mentioned; and, as stated by the projectors, to have them swept out daily. But those conversant with the practical application of sewage to agricultural purposes would hardly think of allowing such solid refuse to enter and choke up the feeders. By the simple and inexpensive grating before mentioned, which retains all the papers and heavy matters, the sewage is rendered so easy of flow that all fear of such nuisance is entirely avoided. The plan, therefore, of tiled gutters would add considerably to the prime cost of irrigation works without presenting any corresponding advantages. Bed-work is alike adapted for level meadows, and for gently-inclined ground with a tolerably uniform surface.

The method of catch-work is usually adopted when bed-work is rendered impossible by the steep inclination of the land, under which circumstance no equal distribution of the liquid could be effected by feeders running *with* the slope. Land, therefore, possessing this abrupt inclination, should be intersected *transversely* with the slope, and parallel with the main conduit, by level lines contoured one above another along its surface, which lines mark the position of the feeders. These may be of more or less distance apart, and should have direct communication with the main conduit by means of side-channels, and when filled, their contents flow evenly over the lower side, down the intervening slope, fertilising the soil in its progress. What is not absorbed by the ground is caught by the next feeder, whence it is again discharged, and this process is repeated until, having reached the bottom of the declivity in a state of comparative purity, the water falls into a catch-drain. It must be observed that as the lower parts of the ground are reached, the direct supply of sewage to the feeders should be materially diminished, so that no portion should receive more than its requisite share, and that none of the sewage should escape without traversing a sufficient purifying area. A very slight fall should also be given to the contour canals to admit of their cleansing or emptying themselves, when the process of active irrigation is discontinued. As to whether it may be deemed sufficient not to effect communication in every case between the main supply and the feeders, this point may be ruled by circumstances.

If irrigation by catch-work is not so thoroughly perfect in the purification of sewage as bed-work, inasmuch as a certain proportion must pass over the surface of the ground without percolation to the roots of the plant, yet there can be no doubt that it is very effective, and may be accomplished at a far less cost. By these methods of irrigation, sewage may be applied to grass crops once in ten or fourteen days, almost up to the moment of cutting the crop.

At Croydon, 3*l.* to 4*l.* per acre were allowed by the local Board to its tenant, Mr. Marriage, for the preparation of the ground into bed-work, in the execution of which many woods and shaws were grubbed up.*

Edinburgh, Aldershott, Norwood, Croydon, Rugby, Bury St. Edmund's, Barking, and almost all those irrigation works which are prominently associated with the progress of the utilisation of sewage, have adopted the open conduit system. Mr. Baldwin Latham, the well-known engineer to the Croydon Board, whose connexion with the Croydon and Norwood works entitles his opinion to very considerable weight in this important question, considers this the simplest and most effectual mode of application, and this opinion is borne out by the Rivers' Pollution Commissioners, Mr. Bateman, Mr. Rawlinson, Mr. Walker, of Rugby, Messrs. Napier & Hope, Mr. Lawes, and others.†

2. *Hose and Jet Distribution from Iron Pipes.*

The power requisite for forcing sewage on to the land, by means of leathern hose affixed to hydrants, is obtained either by pumping or by constructing certain summit reservoirs or tanks, which shall have the necessary head of pressure.

Pipes of cast iron convey the sewage to the land, and are provided with hydrants at proper intervals, to which may be attached the distributing-hose. Glazed pipes of stoneware have been tried at Worthing in lieu of cast iron, but without success.‡ The ground requires no special preparation, but is irrigated through the medium of the hose, which is directed over the area within its compass by a labourer, who carries it to and fro until the operation is complete. Care must be exercised lest any hollow part of the ground should become swamped. About five acres daily may be covered by one jet.

It will be seen that by this method sewage, instead of being applied in a smooth and uniform current to the roots of the crop, is propelled forward with considerable force, and drops in a heavy vertical shower upon the stem or blade,—a process which, in the case of long thick grass, tends to beat down and injure the plant. Whilst the crop is still young, little harm results on this score; but after arriving at a certain stage and growth, the sewage must be applied with great caution, if not altogether discontinued. The strongest recommendation which is urged by the advocates of the jet and hose principle, is its low cost as compared with the expense of throwing the soil into elaborate artificial beds. From 3*l.* to 4*l.* per acre is the *estimated* cost for submains, hydrants, hose, &c., given by Mr. Ellis, who, quoting the Report of the Board of Health, states, "that whereas the average cost of the distribution of bed-work has been 31*l.* 14*s.* 7*d.* per acre, with annual working expenses amounting to 3*l.* 7*s.* 1*d.*, the average cost of distribution by underground pipes and hose has been 3*l.* 5*s.* 1*d.* per acre, with annual working expenses of 8*s.* 11½*d.*"§ But, as we have already seen, that in the case of Croydon, where the ground was not unusually favourable, 3*l.* or 4*l.* sufficed the tenant for laying out the land, we may not unfairly conclude that the statement of the Board of Health is not founded upon a careful examination of facts, and may be suspected of some degree of partiality. Mr. Pusey has stated that catch-work water irrigation has been adopted with great success in Devonshire, at a

* Third Rep. (Aire and Calder, 1867), vol. i. pp. 15, 54.
† Rep. Met. Sewage, 1864: 4712.
‡ Rep. Met. Sewage, 1864: 4100.
§ Rep. Met. Sewage, 1864: pp. 5, 6, Preliminary Report.

* Report Met. Sewage, 1864: 556.

* Rep. Met. Sewage, 1864: 2245.
† The Rivers' Commissioners (Aire and Calder Report) state that the cost of preparing the ground on the open carrier system may be 5*l.* per acre.—Third Report, vol. i., p. 14. "Where main open carriers may be considered a nuisance, as near houses, roads, or foot-walks, they may have covered conduits having cheap outlet-valves at a chain apart."—*Ibid.*
‡ Rep. Met. Sewage: 4105.
§ Report Met. Sewage, 1864: 2450-1-2.

cost of from 2*l.* to 5*l.* per acre.* The very elaborate works at Mansfield, on the Duke of Portland's estate, which are usually cited by the opponents of the open conduit system as illustrative of its great cost, form a wholly exceptional case, having been executed without regard to expenses. These included the reclamation of waste land, drains, bridges, carriers paved with brick, and items of the like unnecessary nature.

It must also be recollected that in many cases sewage, which may be easily gravitated to its destination by means of open carriers, would, under the hose-and-jet system, require pumping up to an artificial head before the pressure could be obtained sufficient to overcome the friction of several hundred feet of earthen piping, so as to admit of its free and efficient discharge. Such additional expense has evidently not been included in the statement of the Board.

It is, however, in the principle of the application of the sewage to the plant that the special defect of this system is held to consist. The vertical discharge from a hose may be likened by its admirers to that of a natural shower of rain; but the comparison hardly holds good by reason of the different degrees of density. It is far likelier one of those heavy flood rains, which do so much damage in advanced seasons, such damage being increased by the deposition of a gritty substance upon the stem or blade of vegetation, very injurious to the value of the crops. But, it may be argued, it is not intended to apply sewage to grass of long growth. The result of this would be an enormous increase in the quantity of land required to utilise the sewage, thus enhancing what is under any circumstances felt to be the great difficulty attending this question. By open carriers active irrigation may be carried on in the hours of night without the supervision of attendants; but with the hose and jet this would be impossible. One of three contingencies would be inevitable,—firstly, hand-distribution by night; secondly, the construction of a costly reservoir; or, thirdly, the nightly use of an overflow with its attendant waste.

Amongst those who have declared in favour of the hose-and-jet principle of distribution are Sir Charles Fox, Alderman Mechi, Mr. Ellis, &c. It is used at Aldershott by Mr. Blackburn, but to a very limited extent, the irrigation there being for the most part carried on by open conduits; by Alderman Mechi, on his own land at Tiptree Hall; by the Earl of Essex, at Cassiobury Park, near Watford; and on Mr. Harvey's Farm, at Portobello, near Glasgow.

On the other hand, Mr. Walker, of Rugby, first tried the hose-and-jet principle, but found open gutters more satisfactory.† Mr. Latham, in his interesting paper, read before the Society of Engineers in 1866, says, in reference to this system, that it may be viewed as a scientific toy, which is outwardly more attractive than useful.‡

M. P.

* Royal Agricultural Journal, vol. i., p. 367. It is but fair to state, however, that Mr. Pusey places the cost of bedwork at from 20*l.* to 30*l.* per acre.

† Rep. Met. Sewage, 1864: 4697-8.

‡ To be continued.

NON-EDUCATING ENGLAND.

REPORT OF THE EDUCATION COMMISSIONERS.

THE edifices of any period of history afford the most distinct, as well as the most permanent, indication of the character of the age. In the ever-changing eddies of that vast secular transformation of the human race which we know as history, we are apt to lose sight of the movement of the day, from the fact that we ourselves are included in it. But if we can divide our own memory into intervals,—if we recall the phases of life presented, for instance, decade after decade,—the rapidity of change forces itself on the contemplation. Dress, manner, phraseology, tone of conventional intercourse, method of regarding the great problems of life,—what changes have been witnessed in each since, for example, the flight of the Orleans family from France. But the records of these changes are only to be found either by the student, in the form of literature, or by the observer in the form of architecture.

In structural embodiment, the genius of the day is ever reproducing its own image. It may be an age of great power, represented by great structures, which preserve the impress of their character through more changeful times; it may be an age of servility or of degradation, witnessed by the feeble reproduction of the past. But in any case the handwriting of the genius of the time is plain to those who know how to read it.

Our own contemporary time is one of unprecedented structural activity. All over the civilized world the cities of the past are being transformed into those of the present. Paris is being rebuilt; Marseilles is a new creation; the old Italian cities are instinct with a new life; London itself is rebuilding. With all this activity there is a want of guiding architectural genius. Reproduction or adaptation of the past meets us all around. Architects are discussing questions as to the authorship and the origin of style. It is rather the social and the political movement of the day that is forcing the hand of the builder, than the builder who is anticipating and guiding the wants of the public. We have more street building than architecture.

But in one respect the period which has elapsed since 1830 has left records of its flight, such as no preceding age of history has witnessed. If the architect has not been showing original genius, the same blame will not attach to the engineer. First the country, and now the cities, are covered with great works,—unornamental, no doubt; at times even devoid of the truest style of ornament, structural adaptation to their object, but still great works. It is in such structures as the Menai Bridge, the new viaducts that span the Thames, the mighty wagon roofs of our terminal metropolitan stations, that we see the true signs of the times. The immense revolution inaugurated by the steam-engine, has already become commemorated by structures, before which the mouldering relics of the feudal ages are being swept from the face of the country.

We have thus written with a pen of iron and of stone upon the face of England the great characteristic of the times. So far as we hold to the past, there are signs of incertitude and of confusion; so far as we have been compelled to provide for a new future—a future so new that it hardly seems to be the product of the past,—we have evidence of vigour, of originality, of skill; and we have just been called on, in a tone as loud as thunder, to detect the same difference in that which underlies all external structures, the very framework of society itself.

Our attention has long been directed to the subject of education. Three commissioners have been appointed within the last ten years to attest facts, as to the state both of our own schools and of those of Europe and the United States. The commissioners have had a patience worthy of their task. Reports of the utmost value have been in print since 1866; but it is only during the past month that the first of the twenty volumes which the commissioners are preparing for publication is presented to the public.

It is not using exaggerated language to say that the aspect of the facts, collected under the direction of the several commissioners, is such as to take away the breath of any one to whom they are presented in thrilling novelty. Uneasy feelings have been present in the minds of most thoughtful men; but when a careful study of the information now in course of issue to the public shall have made them masters of the salient outlines of the case, these feelings will be replaced by mingled wonder, alarm, and humiliation. Not that these feelings will be unleavened by a solid ground of hope. There are bright, very bright, points, amid our insular darkness.

An abstract of the reports now in course of publication would in itself exceed any reasonable limits that our pages could afford, and an abstract could have but little value were it not of considerable length. The study of a single detailed report would do more to bring home to the mind the impression under which we write, and which we would gladly communicate to our readers, than a far wider range of information thus acquired at second-hand. Those who believe that in the education of the young lies the key to the future of the country, will not fail to consult the reports for themselves. If they cannot see with their own eyes, they will at least desire to look through the glasses of the assistant commissioners.

The grand outlines of the case are these. Europe and America, in all parts that can be spoken of as progressive, almost in all that can be called civilized, are educating the youth of the respective States on some definitely organised, provident system. To this general rule there are certain exceptions,—chiefly Spain, Austria, Rome, and the United Kingdom. Spain we may for the moment disregard, as a country which, since 1830, has been continually on the verge of a volcano. Austria is undergoing transformation, and since Mr. Arnold compared the institutions of that great geographical agglomeration with those of this country, the Legislature of Hungary have determined that the school shall no longer be left beneath the blighting shadow of the priesthood. In Rome, so long as the triple crown is propped up by the Chassepot rifle, education of course means excommunication, exile, imprisonment. Priestly government and popular education are irreconcilable even for a week.

Amongst those countries, then, which may with more or less justice suppose themselves entitled to compete for the leadership of Europe, or at least for one of the highest seats in her council, England stands alone as a non-educating country; and it is tolerably clear that unless she entirely frees herself from this inconceivable reproach, that her claim to a position in the van will soon become a mere empty boast.

It is impossible to investigate the state of things now laid bare by a patient and searching inquiry, without admitting the conclusion that we have neither high nor secondary education organised in this country. We have some few admirable schools, in which secondary education of a high order may be obtained. But such schools are rare and brilliant exceptions. Our universities, it is hard to deny, are unfitted to the state of knowledge of the day, although fitted to that of our usual style of education. High instruction is only to be attained in them in some branches of study, at the personal expense of the under-graduate, by paying special tutors, and in other branches not at all. It is not that we have no learned men,—no able men,—but the system is such as to render these men as inefficient as possible.

The secondary education which is now offered to the choice of parents is provided by private schools, proprietary schools, and public schools. Of the latter, all that can by any stretch of courtesy be spoken of as deserving the name, contain 16,000 scholars. The French public secondary schools, with a population exceeding our own by 45 per cent., contain 66,000. The public secondary schools of Prussia, with a population of a million and a half less than our own, contain (in round figures) the same number of 66,000. The universities of England contain 3,500 students. The universities of Prussia contain 6,362. But all the Prussian students are admitted by a real examination, not a test of the power of retaining cram for a few days or weeks, but a serial set of tests of having passed through a serious education. For many of our students Oxford and Cambridge are very agreeable clubs; for all Prussian students the gymnasiums and universities are admirable preparatory schools for the real business of the life of highly-educated men. "An admirable English mathematician," writes Mr. Arnold, "told me that he should never recover the loss of the two years he wasted under schoolboy-instruction at an English university, when he ought to have been under superior instruction, for which the present university course in England makes no provision."—"Who can estimate the loss to the mental training and intellectual habits of the country from an absence,—so complete that it needs genius to be sensible of it, and costs genius an effort to repair it,—of all regular provision for the scientific study and teaching of any branch of knowledge."

No country in the world has organised a scheme of universal education, that is to say, universal in the sense that different boys and girls should only differ from one another, in the course through which they pass, in the number of years which they spend at school. We are not urging that this is desirable, or even affirming it to be possible. But if not, it is clear that a first requisite in drawing up any plan for systematic education, must be the classification of the subjects of that education according to the number of years which they may be able to spend under schooling. Hence the first important division of education into primary, secondary or middle-class, and high. The line in this country appears to be drawn at the twelfth or thirteenth year as the upper limit of the first, and at the eighteenth or nineteenth as that of the second.

Now, if we regard the sixth or highest standard of the Revised Code, as stated in the Report of the Committee of Council on Education for 1865-1866, as defining the natural limit of primary education, we shall come to the conclusion that we are thankful for small mercies. The boy educated up to that sixth standard must be able

to read correctly "a short ordinary paragraph in a newspaper or other modern narrative." He must be able to write correctly from dictation "another short paragraph in a newspaper or other modern narrative slowly dictated once by a few words at a time." And he must be able to work "a sum in practice or bills of parcels."

In the City of London School, which justly claims to be regarded as one of the best organized and most successful of our educational establishments, the second division of the junior department contains boys of the average age of 11½ years. This class may, therefore, be taken to represent the highest phase of primary education in England. The subjects taught are,—New Testament, History, Geography, Grammar, Arithmetic, Writing, Dictation, and Chemistry. The mere enumeration of the studies does not, of course, give much information as to the proficiency of the students; but it must be observed that this division consists of boys who are in their third year of instruction on the same subjects, and that those who pass to the first division of the junior department containing boys of 13 years' average age, only add lessons in French to the above list. There is also a separate grammar class, containing boys of 12½ years old, in which Latin is commenced.

In the French public schools, the children are admitted to the eighth or lowest class as young as seven years of age, if they can read and write. There is a lower and unnumbered class, into which children are admitted as early as six. Latin is commenced in the *huitième*, and grammar after two years' schooling. The education of the French boy is thus from two to three years in advance of that of the English boy. We do not consider this an advantage. The general adoption of a system resembling that of the City of London School would, in our opinion, other things being alike, turn out a far more vigorous, healthy, and helpful race of young citizens than the severer course adopted in France. But it is not with us yet come to the choice of the best system. We have first to admit the necessity of the adoption of any system at all.

In Prussia, a nine years' course of education is required to be regularly gone through before obtaining admission to the university at eighteen or nineteen. In the *Realschulen*, or schools which aim at preparation for business life, there is either a course of nine years, in which Latin is obligatory, or one of seven years, in which it is not. Drawing is obligatory thoughout all the Prussian secondary schools. In Switzerland, every child between six and sixteen—one-fifth of the population—is under school discipline to a certain extent.

The question recently so much debated among ourselves as to the proper place and position of classical teaching in an education course, receives much light from the experience of the Continent. It is important to distinguish between the two separate claims of the dead languages upon the attention of the organizers of education. Latin and Greek, by the general consent of highly educated men, form an essential, and even a dominant, portion of the highest class of intellectual culture, such, for instance, as it is the object of the Prussian universities to impart. Even in this highest form of classic study, however, there are two distinct views as to the object chiefly to be followed, some teachers giving chief attention to the mastery of the science of language, of grammar, composition, and philology, and others more especially regarding the literature of the classic times, and seeking to fill and to train the mind by intimate converse with the great writers of the past. Neither the one nor the other of these objects can be set before the boy whose school education is to terminate at his twelfth or fourteenth year, and it is therefore urged by many, and even by some not uneducated persons, why teach Latin at all to any boys who are not destined, at all events, to pass through a full course of secondary education? Attempts have been made to meet this demand of the modern utilitarian spirit, and it is a curious fact that in Prussia, in France, and in Italy the proportion of non-classical to classical students is almost identical, the former constituting rather less than the third part of the total number. But the reply given to the question, the truth of which seems to be borne out by the balance of the evidence on the subject, is this. Latin is not taught to the primary or elementary student for its own sake. Neither the philosophy nor the literature of the language is regarded by his education. But as a means of mental discipline,—a means of opening the mind and of communicating to it,—not knowledge, but the power of acquiring knowledge,—the rudimentary study of Latin is the best method known to experience. As a rule, this would seem to be the case. Something must depend on the pupils, more on the masters. Some children may aptly learn, and some masters may ably teach, whatever be the selected study intended to act as a sort of skeleton key to the mind. Arithmetic, as taught in the City of London School, seems to have been successfully used for this purpose. As yet, however, it would seem that the balance of opinion is in favour of the retention of Latin as a basis of general education, abandoning Greek, when a technical training is rather the object of the scholar's parents than a more liberal and complete culture.

It deserves careful reflection that a study which might well be made use of as an advantageous substitute for rudimentary Latin, a study which, more than any other, would tend freely and spontaneously to open the mind, a study, the importance of which was dimly indicated by Bacon himself, is to be found only among the higher forms of the secondary schools. If natural history were taught with the scrupulous exactitude that seems to be the first requisite for primary education, and with the life and fire that is the glory of the best American teachers, it would soon become apparent that no equally advantageous branch of study could be selected for the commencement of tuition. The interest would be aroused, the habit of attention formed, exactitude of observation would be enforced, the memory strengthened, the idea of a foreign language would be produced in the mind, and explained as far at least as the nouns; the idea of number would be illustrated by the happy labours of the genius of Linnæus; and the child, while his unflagging attention was fixed on the contemplation of a series of natural objects, would be receiving a real training, of a nature to call out all the slumbering faculties without strain or distress. Were this basis of education introduced into the primary school, we might well afford to defer the rudiments of Latin until after the twelfth year, or to omit them altogether from technical or purely commercial schools.

As we turn from the subject the warning voice of Mr. Matthew Arnold lingers in our ears:—"France, Germany, Italy, Switzerland, Holland, have a civil organization which has been framed with forethought and design to meet the wants of modern society, while our civil organization in England still remains what time and chance have made it. The states which we really resemble, in this respect, are Austria and Rome." "Organize your secondary and your superior instruction."

THE CATHEDRAL OF BAMBERG.

IN a paper on "The Mediæval Architecture of Central and Southern Germany," read at the Institute of Architects on the 16th instant, Mr. H. W. Brewer gave particulars of Bamberg Cathedral, which we quote:—

The ancient ecclesiastical "Free City" of Bamberg is about 50 miles from Würzburg. Bamberg from a distance presents a grand appearance, though less striking than Würzburg. The city is built upon seven hills, each of which is crowned by a large church, the most remarkable of which is the cathedral. This noble church consists of a nave and aisles, with a choir and polygonal apse flanked by tall square towers, surmounted by octagon lanterns and spires at the east end, and transepts, apsidal choir, and two lofty spires at the west end. Each choir has a large crypt under it, and is raised 10 ft. or 12 ft. above the level of the nave. They are approached from the nave by double flights of steps, between each of which is an altar on a level with the nave floor. These altars are isolated from the wall in such a way as to leave a space at the back, from which there is a large opening looking down into the crypts. A large chapel with aisles forms a kind of continuation to the south transept. The church was originally founded by St. Henry in the year 1004, and was consecrated in 1012. This building was entirely destroyed by fire in the twelfth century. Of the present church the earliest portions are the eastern choir, lower portions of the two eastern towers, and the three first bays of the nave: these were not completed until 1237. The great eastern apse, the earliest portion of the existing church, is a remarkably fine Romanesque work. It is covered with zig-zags and all kinds of ornament. The nave of the cathedral originally had a flat timber roof, and the present quadripartite vaulting has caused the blocking up of the alternate clearstory windows. This portion of the church is Transitional in character, but the pointed arch is only very sparingly used, showing how very far Germany was behind France and England in adopting Pointed architecture. Nor is this a solitary example; for the church of Kloster-Ebrach, near Bamberg, which is quite Romanesque in character, and exhibits scarcely any use of the Pointed arch, was completed as late as the year 1285. It is a singular fact that the further east one goes in Germany the longer the Romanesque style seems to have been retained. In the south-east of Austria and Hungary there are several Romanesque churches built after the year 1300; for instance, that of Scechisher Reen, on the borders of Hungary, on the doorway of which is an inscription recording its foundation in the year 1330. In the east of Hungary and parts of Servia the Romanesque style existed even to a later date; and the churches of Mannasia and Ipek were both erected after the year 1400, and neither of them possess any Pointed arches. This would seem to argue strongly against Gothic architecture having been introduced from the East.

The next portions of Bamberg Cathedral in point of date are the transepts and western choir, which were completed in 1274; they are very fine Early First Pointed, but with the round arch still used, though sparingly. The two western towers, which are the most beautiful portions of the church, were erected after 1274. These exquisite towers bear such a resemblance to those of Laon, in France, that one is almost led to believe they were copied from the French church. Here we have another proof that the Germans were far behind the French, for the towers of Laon were built between the years 1225 and 1235; whereas those of Bamberg, which appear even earlier in character, were not commenced until after 1274. These towers are square to the level of the choir-walls, and are then carried up octagonally, with octagonal buttresses, consisting of beautiful open arcades, supported upon slender columns. The towers themselves are pierced in all their stories. These stories are marked by bold projecting cornices. The pediments and spires which crown and disfigure these noble towers are either modern or have been altered during the seventeenth century. The interior of this cathedral is very striking and solemn, though plain and severe. the beautiful warm colour of the stone adds greatly to the effect, and the grand quadripartite vaulting of the nave and the eastern choir directly attract admiration. The eastern apse is vaulted with a semi-dome, and the arcade running round the lowest portion is very singular. The arches are supported upon intertwined columns, some of which are tied together with great knots in the centre. In front of this apse stands a modern high altar of very objectionable design, surmounted by a large bronze crucifix, by Thorwaldsen; the stalls are fourteenth-century work. Against the south wall is a bronze effigy to Bishop Ebenett, by Peter Vischer. In the centre of the choir are two other monuments, both thirteenth-century work. As before mentioned, this choir is raised about 12 ft. above the level of the nave, and at the back of the stalls are solid stone walls, separating it from the aisles. Towards the aisles these walls are divided into two stories by beautifully-carved cornices. The lower story is occupied by an arcade of pointed arches, supported upon detached shafts, with richly-carved capitals, quite French in character. The upper story consists of an arcade of trefoil-headed arches, filled with remarkably fine statues, representing the Twelve Apostles and the Twelve Prophets, the Annunciation, and St. Michael and the Devil. The heads are most noble, and the whole sculpture reminds one of the western doorway of Amiens. The spandrels are filled with most charming conventional foliage. These screens are probably of the same date as the western towers.

The two doorways in the eastern towers have very fine statues inserted, of a later date than the doorways themselves; the canopies over them are good specimens of the conventional representations of the Heavenly Jerusalem so common in France and Italy during the twelfth and thirteenth centuries. The great north doorway contains figures of the Prophets supporting the Evangelists upon their shoulders. Under the eastern choir is a large crypt, the vaulting

of which is supported upon two rows of cylindrical columns; it contains a holy well. The nave is very simple internally, and possesses no triforium; the western choir is more rich, and the vaulting ribs are ornamented with small "zigzags." The western apse is singularly beautiful; it is pierced by two tiers of lancet windows, with groups of shafts in the jambs and rich mouldings. The western choir crosses the transepts, and is separated from them by solid stone screens similar to those of the eastern choir, except that they are decorated with thirteenth-century frescoes instead of statues: these frescoes are very much faded, but still are very interesting. The western choir contains a modern high altar, and a fine set of fourteenth-century stalls with canopies over them. In the centre of this choir is a most singular monument, consisting of a classical sarcophagus of white marble, standing upon a thirteenth-century base, and with a twelfth or early thirteenth century effigy lying upon it. This remarkable monument covers the remains of Pope Clement II. who died in the year 1047. He was formerly Archbishop of Bamberg, and is one of the very few popes who lie buried on this side of the Alps. Nothing whatever is known about the history of this most singular monument; the sarcophagus, which is ornamented with centaurs and other mythological figures, cannot well be later than the third or fourth century, and may be very much earlier.

In the western choir are two other remarkable monuments; they are large bronze effigies placed in an upright position against the walls; they are in very low relief, but perfect marvels of workmanship; they are works of Peter Vischer, and represent Archbishops Gross von Trochan and Truchses von Pommerfelden. The transepts are similar in architecture to the western choir. The north transept has a fine rose-window of plate tracery; the walls are arcaded within. In the south transept over an altar is an ivory crucifix, given to the church by the Emperor St. Henry II., and consequently dates as far back as the eleventh century. Attached to the piers of the nave are several remarkable bas-relief monuments of archbishops, two of them are as early as the twelfth century; there are also several frescoes in similar positions, which probably served as monuments. In the centre of the nave stands the magnificent altar-tomb of St. Henry II. and St. Cunigunda: it is entirely of white marble; the sides are ornamented with panels containing representations of various events in the lives of the two saints, and their effigies lie upon the slab of the monument: the workmanship of the whole is very delicate and refined. It is in a most wonderful state of preservation; was executed between the years 1499 and 1505, and is the masterpiece of Tilman Riemenschneider.

As this is the last time I shall have to mention the name of this great master, I cannot help expressing a regret that we know so little of his works in this country. To my mind he was one of the greatest sculptors Germany ever produced; his works are far more severe and simple in spirit than those of Adam Kraft or Peter Vischer, and indicate a great deal of that quiet religious feeling which is so noticeable in works of the thirteenth century.

Attached to one of the great piers of the chancel arch of the eastern choir is a most remarkable work of the thirteenth century. It is simply a life-sized equestrian statue of St. Stephen, King of Hungary. The horse has a wonderfully classical look about it, and might almost have walked out of the "Elgin marbles." The rider is very inferior as a work of art to the horse; he is represented as clothed in chain mail, and is rather stiff and cramped.

In a very small chapel leading out of the south aisle of the nave is an altar with a carved wooden reredos of the fifteenth century; it is the work of Michael Wohlgemuth, and represents the separation of the Apostles: it is richly decorated with gilding and colour. Leading out of the south transept is a large chapel, dedicated to St. Andrew. This chapel is divided into a nave and aisles of equal width and height by two rows of columns. The northern portion is superb First Pointed work, thoroughly French in character, and the southern Late Second Pointed, rather plain. There are three altars, two of which are ancient; the reredos of one of them is a large triptych inclosing a picture by Lucas Cranach, containing more than 300 heads. The walls of this chapel are entirely covered with bronze monuments, representing archbishops, bishops, and priests; they are in low relief, and consist of life-sized effigies standing under canopies. The earlier ones date from the end of the fifteenth century, and the latest the commencement of the sixteenth. The earlier ones are very spirited and fine, the late ones are poor and flat. In this chapel and other parts of the cathedral there are more than 130 of these monuments. The sacristy, which is very interesting, is entered from the chapel; it contains a superb pascal candlestick of silver, about 5 ft. high, bearing the date of 1216; is covered with foliage, birds, beasts, and all kinds of ornament, and bears a strong resemblance to the "Gloucester candlestick," exhibited at the Loan Collection, except that in the Bamberg candlestick the work is more delicate and refined. There is a large reliquary of silver and crystal, about 8 ft. high, enclosing a smaller one presented to the church by St. Henry in the year 1004; this contains a third reliquary, of probably a still earlier date, entirely of cut crystal, within which is one of the largest relics of the true cross known to exist; the relic itself is in the shape of a cross, about 9 in. long and 4 in. across the arms. Whatever opinions may be entertained respecting relics, whether we believe that this piece of wood is a portion of the true cross or not, few can look without interest upon an object which caused the foundation of one of the grandest churches of Germany, of a city belonging to the most powerful and most ancient prince archbishops in Southern Germany, and second in historical interest to none in Central Europe. It was to enshrine this relic that St. Henry erected the first cathedral on this spot. Subsequently he gave the town to the archbishop and his successors, and the town of Bamberg owed its importance to the pilgrims of all nations, many of them kings and princes, who came to visit this relic. In so great reverence was it held that the town, although at one time containing nearly 40,000 inhabitants, was never fortified, and it is probably the largest ancient town in Europe which has never had any means of defence. The sacristy also contains a remarkably fine remonstrance of the fifteenth century, two reliquaries of the same date, and a vestment of the fourteenth or fifteenth century.

Bamberg Cathedral, as before stated, stands upon the top of a hill, and round the church is a terrace with a curious fifteenth-century work parapet, and a kind of stone reading-desk at the east end.

THE CASTLE OF COUCY.*

THE castle is composed of a keep, an inner and an outer ward. The outer, about thrice the area of the inner ward, intervenes between the inner ward and the town. Its narrow south front has been described. Towards the north-east the hill is very steep, and the revetment wall on this face is not reinforced by buttresses or flanking towers. On the opposite face the ground is far less steep, and the platform projects in a bold salient towards the south-west, the revetment of which is strengthened by eight mural towers or bastions, some half-round and the others rectangular. The south wall is lofty, the others were probably mere parapets. The great gate-house, or "Porte de Maître Odon," is now much broken down. The portal arch was pointed, as are two lateral arches for the guard. The square groove of one portcullis remains. The gate-house seems to have been of the usual rectangular plan, having a central portal arch and passage, and two exterior half-round flanking towers. In this outer ward are to be traced very considerable foundations, and here are found fragments of piers and arch stones, and carved blocks, showing that the buildings erected as stables and barracks for the castellan, and probably, in times of peace, for the lord, were very considerable, and of a handsome character. Here also are the foundations of a church, recently cleared out. They show a single nave, with a semicircular apse, and a transept, the two arms of which have, on their eastern sides, two smaller apses, the three ranging nearly in a line. The building is about 100 ft. long by 30 ft. broad; has a double west door, and five windows of a side, besides three in the apse and three in each limb of the transept. From its plan and proportions this church has been regarded as part of the original castle, and the only part now remaining. Its actual date is, however, probably of the eleventh century.

The inner or north end of this ward abuts upon the inner ward. This front is occupied by a broad and deep dry ditch, concave towards the outer ward, having a walled scarp and counterscarp, and crossed at each end by the exterior enceinte wall of the place.

The inner ward, or castle proper, is four-sided. The east face, of 130 yards, and north face, of 60 yards, are both straight, and set at right angles. The east front, of 70 yards, is set at an obtuse angle to the north, but is also straight. Thus breadth is given to the south front, which is 130 yards. This front is also straight, but about five-sevenths of its central part is occupied by the convexity of the great tower and its chemise, which are placed upon the line of the curtain.

The east, west, and north fronts are towards the field, and are formed by facing the scarped rock with masonry, so that they stand 30 ft. to 40 ft. high to the level of the *terre-plein*, above which rises the curtain-wall. The south front is covered by the ditch already described, and which is segmental in plan, with vertical sides. Near its east end this ditch is expanded from 60 ft. to 90 ft., and was there traversed by a long drawbridge, which rested upon three detached rectangular piers, of which the inner one was the largest, and contained two lateral places of arms, and no doubt carried a tower. This bridge led up to the main gate. It is now replaced by a causeway.

At the four angles of the ward are four equal drum towers, 60 ft. in diameter, and 105 ft. high from the exterior base. They are remarkable for their size and boldness, being engaged only by one-fifth of their circumference. These towers rise from the rock, and contain two domed stages below the terre-plein level. These are entered by a circular hole or eye in the centre of each vault. The terre-plein level of each is a hexagonal chamber, vaulted, having five recesses, of which four are pierced as loops. The entrance is in the gorge, with two lateral passages, one leading to a garderobe and one to a well-stair, ascending to the summit.

The chamber above is similar, but the loops are placed between instead of over those below; and thus the towers have been preserved from those vertical fissures so common when a series of loops or windows occur, as they usually do, in one vertical line. By this arrangement, also, the scope of the archers defending the tower is much increased, every point within arrow range being exposed to fire. There are three floors above the ground-level, or five in all. All are vaulted. A line of corbels at the present summit shows that they were originally defended by a *bretasche*.

Nearly in the centre of the east face was a small half-round bastion with flat sides, 30 ft. in diameter, and about 20 ft. projection.

Standing in the court, no part of the curtain is visible. Along the central 180 ft. of the east front is a range of buildings, called offices, about 30 ft. deep, and having three well-staircases, serving the first and second floor, now destroyed. At the south end the space between the curtain and the tower chemise, about 60 ft. by 80 ft. is occupied by three aisles of vaulting, each of three bays. The centre of these is the main entrance, or continued portal arch. The lateral bays are for warders and soldiery in charge of the gate. There were two stories above this, now destroyed.

Along the north front was originally a vaulted arcade, 45 ft. broad, composed of four bays. To this has been added, in front, an arcade of three arches, open towards the court, and upon the platform thus gained have been constructed a terrace and a range of state rooms, of which the principal is the ladies' hall, or *salle des preuses*, so named from the medallions of nine celebrated women which adorned the great chimney-piece. In the exterior was a sort of oriel boudoir, and large windows towards the field. Above this was another story, to construct which the curtain was raised. These buildings were the addition of the Duke of Orleans. A large well-stair, also an addition, led from the court to these apartments.

The west side also has a high curtain, against which is constructed a magnificent chamber, 45 ft. broad by 470 ft. long, down the centre of which stands a line of ten columns, dividing the space into eleven vaulted and groined bays, of which the northern pair are cut off as a private cellar. On the east side of this chamber are four doors, two near the centre opening into the crypt of the chapel, one south of this, probably the main entrance, and one near the south end, opening into what appear to have been the kitchens, and which lie between this splendid

* See p. 191, *ante*. Also for Plan.

range of magazines and the great tower. Connected with the kitchens are three courts, and a staircase descending to the cellars.

Below the chamber is another of equal size, excavated in the chalk, as a cellar, probably about the finest and most spacious ever constructed.

Above, on the first-floor, or third stage, was the great hall of the castle, called from its nine effigies of heroes, *La Salle des Preux*. It had a wooden roof, two large fireplaces, and a large window at the south end, below which a small door opened upon a light wooden bridge, which dropped upon the curtain of the outer ward, just above the postern.

The chapel was a rectangular building, 60 ft. east and west, by 36 ft. north and south. It projected from the hall into the court. It was composed of two parallel aisles, vaulted, each in four bays. Its south-east angle was engaged with the chemise of the great tower. Its south-west angle was free, and had two buttresses set on at right angles. This chapel is now destroyed to its foundations. It opened from the great hall.

The keep, or great tower, is the boast of Coucy, and deservedly so, being one of the finest towers in the world, and no doubt the largest and most complete single military building.

It is a plain tower, perfectly cylindrical, of excellent ashlar workmanship, 100 ft. diameter at base and summit, and 200 ft. high. It rises out of a paved moat, the base being about 12 ft. below the level of the terre-plein, and is entered by a drawbridge from the level, all below being solid.

Including the basement, the tower contains three stories. The ground floor, on the level of the terre-plein, is entered by a drawbridge laid across the ditch, and which, when raised, covered a small square-headed portal, under a pointed arch, the entrance to a passage directly piercing the wall. The passage has an interior machicolation and a portcullis, both worked from a small chamber in the wall above, which also received the chains of the bridge. Within the portcullis was a stout door barred within, and, on the left and right, passages, one to a mural garderobe with an exterior loop, the other leading to a well-stair which served the upper rooms and led to the ramparts.

The entrance-passage leads direct into a duodecagonal chamber of about 60 ft. diameter, having a recess in each floor for stores, one occupied by the entrance, one by a large well, now about 90 ft. deep and formerly 200 ft., and one by a chimney.

Each pier is faced by a column, from which springs a rib, the twelve meeting in the centre at an eye, and supporting the vault. Each vaulting cell has a pointed gable, of which two are pierced for light.

The first-floor is of the same figure and diameter, and vaulted in a similar manner. One of its recesses is closed by a fireplace with an oven behind it; one gives passage to a very narrow postern, the plank bridge from which drops upon the rampart of the chemise wall, and three are pierced by small windows. One of these window recesses is entered laterally by a small passage from the adjacent recess. This is of fifteenth-century work, made when the recess was walled up to serve as a separate chamber. Another recess has also a lateral passage, entering a small mural garderobe, looped from the outside. In one recess are two windows, one above the other.

The second-floor, resembling the other in plan and diameter at its floor level, has a different arrangement at a height of 12 ft. Here the piers cease, and behind, between them and the outer shell of wall, is a gallery, entered by the regular well-stair, but each of the eleven other compartments of which forms a box like that of a theatre, looking down upon the central pit or floor. Two of these boxes are occupied by the detached flues of the two chimneys from below, and two are lighted by windows, which, with the central eye, form the whole and very insufficient light. In this chamber, the next below the battlements, the commander could collect and address a very numerous garrison.

The third-floor, that of the ramparts, and open above, is contained within a thick and lofty parapet wall about 10 ft. high, and pierced by twenty-four lancet arches, and as many intermediate loops. Above these the wall is surmounted by a grand coping, which overhangs both ways about thrice the thickness of the wall, and then slopes upwards into a ridge. It was upon this ridge that were laid the roofing rafters of the *brétasche* gallery, which enclosed the wall inside and outside. The former was merely as a counterpoise. The latter was of two stories, and rested its main struts upon a line of forty-eight grand corbels, which remain on the exterior face of the wall at the rampart level. The flues appeared above the roof, and three large and highly crocketed pinnacles were placed astride on the crest of the wall. The stone vault of the upper chamber was covered with lead, with occasional gutter openings outwards.

Nothing can be grander than the conception of this tower, nothing more complete than the execution of its details. All is gigantesque, as though for a race above the ordinary stature of man, and the walls within were overlaid with a fine cement, and painted with care. The design of the sculpture is bold and masculine, as becomes a military building; but all is in excellent taste, and admirably executed.

The walls of the keep are tied with chain-courses of timber, laid in mortar, in the centre of the work, as was the custom in France in the twelfth and thirteenth centuries. The timber is exposed below some of the loops. In the upper floors were imbedded radiating ties, also of wood.

Two lines of square putlog-holes are seen on the exterior of the keep. They ascend in a spiral, or a right-handed screw, and indicate the manner in which the building was constructed. Horizontal beams, projecting from the upper row, carried the inclined plane or roadway up which the materials were dragged, and these were supported by struts, the feet of which rested in the lower row.

There remains to be described only the *chemise*, or work designed to cover the base of the keep from the operations of the miner. It has been seen that the base of the keep was solid, and that it stood in a paved fosse, about 20 ft. broad, with vertical sides. The exterior side, or counter-scarp, of this fosse was a wall, about 8 ft. thick, which divided it from the main exterior ditch of the ward, and rose to the level of the first floor of the keep, say 30 ft. The ordinary ascent to its rampart walk was by a stair within the wall, commencing on the right near the keep entrance. It was also reached from the first-floor of the keep by a slight bridge, such as was employed at Rochester, and probably in one or two places in the Tower of London. There was also an access from the other end of the wall, from the rooms over the great gateway.

Outside of and at the base of the salient half of this wall was built against it, at the level of the bottom of the exterior ditch, a covered way or gallery, intended to act as a countermine, and still more completely to frustrate attempts against the keep. The gallery is entered from either end, and in its centre rises a sort of buttress against the wall, in which was contained a wooden stair, by which the people on the rampart could communicate with those in the gallery. In the gallery also was a well, for the use of the kitchens, and in the substance of the wall a garderobe.

From the bottom of the keep ditch issued a postern, defended by gate, portcullis, and machicolation, the two latter worked from a small chamber in the wall; from this a wooden bridge led, in the ditch, to a postern in the west and outer wall of the outer ward.

The castle and town being of one date, and from one design, may be regarded as representing a thirteenth-century fortress of the first class, and of the strongest character, in which the internal arrangements, though palatial, were made completely subordinate to the military character and security of the place. The great feature of the castle is the keep, which commands the whole, in every part, and from its size and strength could be held with confidence after all the other defences had been taken.

The additions of the fifteenth century, consisting of state-rooms, a hall, and various upper stories, intended for the state and attendants of a court, though not extending to the keep, in some degree injured the military character of the place, and took off from the predominating grandeur of that great central feature. These, however, have for the most part fallen away, and what remains is chiefly original work, so that the appearance of the keep and inner ward is in many respects as they were designed by the great baron, who contemned the titles of king and prince, and was content with the severe simplicity of that of "Sire de Coucy."

The castle in 1652 fell into the hands of Mazarin, who employed Metezeau, son of him who threw up the famous dyke at Rochelle, to render it indefensible. The engineer blew the chemise wall outwards into the ditch, and exploded a heavy charge of powder in each of the towers. The effect of this upon the keep was to clear out the vaulted stages, and to leave the cylinder like the tube of a vast cannon. Thus, with one or two vertical figures, it stood till our day; but now these have been closed with great care and judgment, and the cylinder has been hooped with iron, in a manner that is scarcely to be observed, and will preserve it indefinitely.

Those who wish to understand the details of this most curious place, and to acquire a complete and comprehensive view of it as a military work, would do well to read the masterly exposition of M. Le Duc, sold upon the spot, and given also in this Dictionary, under the articles of "Château" and "Donjon."

The town is also worth a visit. It contains a good church, and its southern gate-house is a very massive structure. The portal is very narrow, about 9 ft., acutely pointed, and it opens between two drum towers of one-third projection, and of about 100 ft. diameter and 60 ft. high. The short curtain between them, occupied below by the gateway, above is convex in plan, and supports two bold brackets, upon which lies a stout beam, a part of the original *brétasche*, and a rare, if not a solitary, instance of a part of such a structure remaining in place.

The drawbridge is replaced by a causeway, but at the base of the gateway are two large square holes, nearly where the axle of the bridge would rest, but which closely resemble drains, which they can scarcely be. There are no marks of external defences, save the *brétasche*. Probably the bridge, when up, acted as a gate. Within the passage, on each side, is a large lateral loop, then two portcullises, and between them a large machicolation. Within the second grate is a gate, and within this the passage is vaulted for about 16 ft. Then follows an open space, of which the roof was of timber, and then a vault. The inner end of the passage is injured, and repaired. Above, over the portal, is a fireplace of enormous size.

This gatehouse is placed in the middle of the curtain which covers the very narrow south-east front of the town. On each side of the gate-towers is a curtain of about 100 ft. long, and beyond this a pair of drum mural towers, of half projection. The loops of these towers, like every detail in Coucy, are on a grand scale. Though mere slots, they are 10 ft. high, and in three tiers. In front of the wall is a fosse of unusual breadth, wholly artificial, and which, like that of the castle, is dug across the peninsula, from one lateral valley to the other. C.

PARIS.

THERE is some talk here of demolishing the Pont Royal, and reconstructing it in the axis of the Emperor's grand entrance to the Tuileries, and in a line, almost, with the Rue de Baune. Up to 1632 the sole means of communication between the Faubourg Saint-Germain and the Louvre and Tuileries was by a *bac* (hence the name Rue du Bac close by), or sort of large boat ferried across the river by means of a rope stretched from one bank to the other. At this period the bridge was a wooden one, but in 1664 it was carried away by an inundation, and the present one built of stone. It was here, also, that the first dredging-boat was used to prepare the bed for the principal pier, under which the coins, &c., of Louis XIV. were deposited, and it will be curious to see those authentic relics laid bare.

We gave some account at p. 659—1867, of the works undertaken to restore the ironwork of the central doorway of Notre Dame de Paris. It was opened anciently only on very rare religious occasions, and we find that it was opened for ceremonies foreign to the general church-service at the following epochs:—Philip IV., called the Bel, on his return from the war against Flanders, entered on horseback into the church to give thanks for his victory. In remembrance of this occurrence, an equestrian statue, as large as life, of Philip the Bel, was erected at the end of the nave. Louis XII., Louis XIII., and Louis XIV., also entered Notre Dame by this door. This last monarch paid a first visit to the church, with the Queen Marie-Thérèse, for the ceremony of the baptism of the celebrated bell, called the Bourdon (in the south tower), in 1685. This bell bears the names of Emmanuel-Louise-Thérèse. The second visit of Louis XIV. was in 1699, when he laid the first stone of the

altar. Behind the altar, under the centre arcade, there was at that period a marble group by Couston, and called Le Vœu de Louis XIII. This splendid work of art partly figures at the Versailles Museum since 1830. The Emperor Napoleon I., on the day of the *sacre*, and Pope Pius VII., passed likewise into the church by this door. Napoleon III. also entered by it on the occasion of his marriage.

The reconstruction of the Halles Centrales, and the disengagement of their neighbourhood, have, for some years, been carried on at the west, the north, and the south sides; the underground stories of the two last pavilions of the second group were finished in the second half-year of 1867. The columns and framework of the roof are erected and the metallic carcass is being put together; so that in a short time these pavilions will be ready to be opened. Of the different thoroughfares projected for this great central market, those of the south (Rues du Pont Neuf and des Halles Centrales), are completely finished; that of the north-east (the Rue Turbigo) continues its diagonal line as far as the Place du Château d'Eau, and the Rue Berger, which is to form on the south a line symmetrical with that of the Rue Rambuteau, will be shortly opened throughout.

The second group of the Halles once terminated, the houses surrounding the Halle au Blé are to be raised, and four pavilions erected in their place to serve as annexes to this vast rotunda. To the west of this group will pass the Rue du Louvre, prolonged upon which will debouch the rues Berger and Rambuteau.

In place of the old fountain of the Château d'Eau, now removed to the new abattoirs of La Villette, the foundations are being laid for that to be erected in its place. It will consist of eight lions, from the mouths of which cascades will fall into an enormous basin, after having passed through two circles bordered with verdure and flowers; at night a brilliant candelabrum of vast proportions will light it up.

At the sale by auction of the collection of M. Roux (of Tours) at the hôtel Drouot, including a variety of artistic curiosities, the "bonquet" of the sale was a small mirror, of the belt of a female, the size of a child's hand, of boxwood, profusely decorated with interlacings; groups of fruit arabesques; figures of genii, &c.; and a woman representing Justice;—on the reverse, Daniel in the lion's den; little genii sounding the trumpet; a figure of a man playing the violin, &c.;—a true little *chef d'œuvre*, inimitable, of composition and execution of the Flemish art of the sixteenth century. Its dimensions are 133 millimètres high by 108 millim. wide. The sum at which it was valued by the appraiser was 400*l.*, and it was sold for 1,000*l.*, *plus* the usual 5 per cent. auction dues. M. Roux had bought it for 3*l.* 4s. (!) fifteen years ago. The purchaser is said to be the Duc d'Aumale, who deputed some one to buy it for him.

One of the best sales of pictures of this year took place at the same hotel, viz., the collection of the Count d'Aquila. The sale of forty-six modern paintings produced more than 8,000*l.*

ABRIDGED SPECIFICATIONS OF PATENTS.*

THESE portly volumes, of 1,400 pages each or so, four of which in number have been forwarded to us by Mr. Woodcroft from the Patent Office, contain each abridgments of a single order of patents, one, for example, relating to Hydraulics, from A.D. 1617 to 1865; another on the Preparation and Combustion of Fuel, dating from A.D. 1620 to 1865; and so on. The selection and issue in a printed form of these volumes cannot but be of immense service to all interested in the taking out or the resisting of patent rights, as they obviate the necessity for an endless search at the Patent Office amongst the heterogeneous mass of extended and often wordy patents of all sorts for some one special order of patents. The abridgments or abstracts are short and as explicit as possible too, thus saving additional time in search even through the volumes themselves, which afford still further facilities by the addition of a full index of names, and a still more valuable index of subject matter. In the volume relating to Hydraulics, for example, in the index of subject matter, everything is separated into distinct heads, such as Aërated Waters, Baths, Beer-engines, Boring, Canals, Cocks and Taps, Culverts, Docks, Drains, Drinking-fountains, Filters, Fire-engines, and so on in a multitude of headings all through the alphabet. This volume, by the way, is all the more especially useful in our province that it includes a great many patents for sanitary purposes, as the following summary of its contents will show:—

"This series relates to raising, forcing, storing, filtering, supplying, measuring, and regulating the flow of water; it also relates to irrigation and drainage, to apparatus for the employment of hydraulic motive power, and to the appliances for its domestic and sanitary use, such as joints for pipes, taps and cocks, fountains, baths, and water-closets; moreover, it includes improvements in the form or arrangement of sewers and drains, designed to facilitate the flow of water; in flushing or otherwise removing obstructions; in trapping; in excavating or cutting trenches, ditches, and drains. But it is not intended to include materials for or methods of manufacturing or constructing sewers or drains; these will be found in the series of abridgments entitled, 'Tunnels, Subways, and Sewers,' and 'Drain Tiles and Pipes.' Nor is it intended to include improvements in the collection and treatment of sewage; these will be found in the series of abridgments entitled 'Manure.'"

The number of specifications printed and published at the time of the issue of this volume amounted to nearly 61,000; and the number included in the other volume on Combustion of Fuel was 59,000.

Each volume contains an Introduction, giving a rapid and brief *resumé* of the history of the subjects patented in each. There is thus a short historical treatise or essay on Hydraulics in the volume relating to Hydraulics; and one on Fuel and Combustion in the corelative volume.

So early as 1630, we see, from the volume on Hydraulics, a patent was got by one David Ramseye, "to make boates, shippes, and barges to goe against wynde and tyde." The draining of water out of mines and marshes by hydraulic engines appears as the subject of various patents of about as early a date; and canals and waterworks are also amongst them. The eighth patent on the list was granted to Hugh Middleton "for the wynning and drayning of many grounds," granted "for the good opinion wee have conceived of the said Hugh Middleton, or that worthy worke of his in bringing the New River to our Cittie of London, and his care and industrie in busines of like nature tending to the publicke good." The second patent on the list, of date 1618, was granted to David Ramsay and Thomas Wildgosse "to ploughe ground without horse or oxen." John Gilbert, in 1618, got a patent for a "new engine or instrument called or termed a water-plough, for the taking vpp of sand, gravell, shelves or banckes of the river of Thames," &c. In 1638 a patent was granted to Sir George Horsey, Dudd Dudley, and others, for "the makeing of iron with sea or pitt coale, peate, or turfe, and with the same to rost, melt, or refyne all mettalls of what nature soever." All these and the other patents in these volumes can be had separately, and not as mere abridgments, in a printed form, from prices varying from 4d. and 6d. to 2s. or 3s.

The volume on "Fuel and Combustion" shows that smoke consumption was a very early subject of consideration and experiment. In the Introduction to this volume a curious fact is brought forward from "Pennant's Tour in Wales," p. 17, that a "flint axe was found in an out-crop of coal in Monmouthshire," and similar discoveries have been made near Ashby. Of course it is not to be inferred, all at once, from this that it will form evidence of the existence of man in the carboniferous era, although even that would not be too startling an inference in these days; but that coal was probably used as fuel in exceedingly ancient times.

It is mentioned, in this Introduction, that of date 1686, a plan for making the fire gases and smoke of a wood fire descend downwards through the fuel, was invented by Mr. Dalesme, and is alluded to by M. De la Hire, in his "*Reflexions*" "*sur la Machine qui consume la Fumée*," at p. 406, of vol. x. of the (1686) *Mémoires de l'Académie Royale des Sciences* (Paris. 1730); and that Dr. Franklin invented in 1785 a revolving grate, with a circular fire cage, and so made as to be capable of being turned round, after being lighted, in order to bring the fresh coal *under* the burning coals, and thereby prevent the development of smoke. (From "The Transactions of the American Philosophical Society," January 28, 1786, into "The Complete Works," &c., of Dr. Franklin, London, 1806, vol. ii., p. 314.) A down-draught stove, the construction of which is based upon that of Dalesme, from which it was avowedly taken, is also described.

Altogether these volumes must not only be exceedingly useful, but they are of great interest historically and archæologically as well as scientifically speaking; and the work of compilation and condensation, which must have been a most formidable one, appears to be excellently well done. The other two volumes before us relate to Railways, and to Raising, Lowering, and Weighing.

* Patents for Inventions: Abridgments of Specifications. Printed by order of the Commissioners of Patents. London: Office of Commissioners, 25, Southampton-buildings, Chancery-lane, Holborn. 1868.

THE ARCHITECTURAL EXHIBITION SOCIETY.

WE would remind our readers that the annual Exhibition in the galleries of the House in Conduit-street, will be opened on Monday, May 4th next, and that all drawings must be sent to the galleries on Wednesday or Thursday, the 8th and 9th days of April. The committee desire to give to the architectural profession, and the public at large, a convenient opportunity of exhibiting and inspecting well-executed representations of the works now being executed by individual architects and others interested in art. In furtherance of these objects, and in addition to the usual attractions of the Exhibition, they are desirous of receiving perspective and geometrical drawings of all new buildings, with such particulars as to plan, construction, cost, draughtsman, or artist, as may be desirable; and, in addition, photographs of buildings already executed, original sketches, working drawings, sketches of old works, and competition or other designs, which may recently have been prepared. The Committee have also decided upon accepting a limited number of purely artistic drawings of architectural subjects. They have published a list of towns in which honorary secretaries are desired. Some of our readers may be disposed to act in that capacity.

ARCHITECTURE IN THE ROYAL SCOTTISH ACADEMY.

THE architectural drawings exhibited this year are remarkable neither as to quantity nor quality. A few of the designs show some amount of thought on the part of the authors; but others not only exhibit an utter want of it, but a disregard of, or incapacity to appreciate, the laws of harmony and proportion. Notwithstanding all that has been written against the use of "constructed ornamentation," and the debased forms of the later renaissance, broken pediments, gables without roofs behind them, and detached columns supporting nothing, continue to appear. No. 192, "Langton House, Berwickshire," is the work of Mr. David Bryce, the leading architect in Scotland, and he has designed many mansions, and added to or reconstructed more; but we do not recollect of any instance save this where he has reproduced so much meretricious detail. The mansion is certainly a large and stately one, but it is ostentatious; and the portal is flanked by three tiers of detached pillars, which do no other duty than thrust themselves forward to be looked at, and the carving is mostly made up of large scrolls, which sprawl out wherever an opportunity presents itself. No. 118, "Free St. George's Church," as designed for the site ultimately chosen, is Palladian in style, and without the tower would be a poor production. The tower is, however, a striking feature, made up of a series of arched unglazed openings, and adorned with statuary. The style adopted is undoubtedly more in keeping with the surroundings than would have been the Gothic church (No. 162), designed for the site first fixed upon.

No. 57, "Free High Church, Partick," by J. Honeyman, is a gracefully proportioned edifice of fourteenth-century Gothic, and it has been skilfully adapted to the slope of the ground, the result being quietly picturesque, without the architect having gone out of the way to produce that result.

Mr. Pilkington's "Dundee Church," No. 270, is an effort at producing picturesqueness by the addition of many little adjuncts to the main building: these addenda detract from the dignity of the building, which would be better without them. The spire is a fine piece of composition, bold and gracefully proportioned.

No. 194, "Church of St. Michael and All Angels, Helensburgh," Robert Anderson, architect, is neither picturesque nor graceful, the

general effect being heavy and uninteresting; the detail appears to be faultlessly correct, but the little slits of windows, both in the aisles and clearstory, are rather primitive. Mr. Anderson seems to be more successful with his interiors than with his elevations. No. 210, "Interior of Church of St. John the Evangelist," at Alloa, is broad, simple, and well proportioned.

Nos. 211 and 231 are the first efforts at church-building of Mr. J. W. Smith. We prefer the former to the latter, the main gable of which is weakly treated. Mr. Smith will pardon us for advising him not to aim at giving too much for the money; his churches would be much better if more simply treated.

No. 120, "U. P. Church, Newtown, St. Boswell's," by Mr. John Paterson, is liney and characterless, notwithstanding an effort at novelty in the arrangement.

No. 103, "Design for a Church in Glasgow in the Mixed Moorish and Lombardic Styles," by Mr. J. T. Rochead, is quite out of the ordinary run, and is more peculiar than beautiful: the slender campanile is not a feature that would appear to advantage amongst the high chimney-stalks of Glasgow.

No. 160, "Perspective View of the Choir of St. Giles's Cathedral, showing the Improvements proposed by the Lord Provost;" R. Matheson. This does not pretend to be a restoration, the requirements of the Presbyteriam form of worship being incompatible with the arrangements usual in a cathedral choir, and the only course left to the architect was to give the interior the semblance of such. This he has done by arranging the stalls against the walls of the aisles and across the east end, substituting open benches for the present heavy pews, and leaving an open railed-in space in which the pulpit and font are placed. The stalls are copied from those in King's College Chapel, Aberdeen, the best remaining example of ecclesiastical wood carving in Scotland. They are in perfect keeping with the style of the cathedral. The pulpit has a rather tub-like appearance; something of the nature of a platform would be more appropriate. The mutilated tracery is left as it was: as we stated in a former notice, all character has been knocked out of it by paring down; to place stained glass in it would be worse than setting a fine picture in a shabby inartistic frame.

No. 42, "United Presbyterian New Church, North Berwick, in the Early English or Pointed Style of Architecture; the small Island of Craigleith and Firth of Forth in the distance," Robert R. Raeburn, architect. The intelligent reader may form a guess of what kind of church this is from the entry in the catalogue which we have quoted: in form it is hideous, and in style execrable; the pinnacles which surmount the buttresses are certainly not Early English, and if of any style at all are of that which was in vogue a century ago. We advance these remarks solely in the interest of art. It is sometimes necessary to speak strongly, and no one who knows aught of the art of building will, we venture to say, attempt to defend such a design as the one in question.

No. 61, "House at Weston, near North Shields, Durham," by Douglas & Stevenson, is Italian Gothic in style; the arrangement of the parts is pleasing and natural, and the detail good. There is a homely unostentatious look about this house, which suggests the idea that internal elegance and comfort have not been sacrificed to external effect.

No. 16, "Tenements at Heriot Mount," R. Thornton Shiells.—This is a bold and effective group of Scottish turreted dwellings,—rather severe, perhaps, but well suited for the locality which they occupy on a height overlooking the Queen's Park and in the proximity of Salisbury Craigs. Had the other dwellings in this neighbourhood been well designed, the views of the city from the craigs would have been greatly enhanced; as it is, they are "stale, flat, and unprofitable:" a rare opportunity of producing a fine effect, at small cost, has been missed.

No. 249, "Kingsknowes House," Wm. Hay.—In the Scottish Baronial style. Stone was the invariable material used, and the detail was vigorous rather than refined. We have here, however, a building which has more the character of a brick than a stone structure.

Mr. Pilkington's "Dundee Club," No. 273, is unlike any other building of this class that we know of; it is marked by an individuality which characterises the designs of this architect. The style may be termed Byzantine; the openings consist of wide round-headed arches, and the windows of the first-floor have an open-framed margin in stone. There is a certain vigour about this design, as well as in the mansion No. 228, similar to it, which would be highly commendable were it combined with elegance and gracefulness of proportion.

Mr. James Gowans exhibits a large view of part of Castle-terrace (No. 153), which is in course of erection. This terrace will form a marked feature in the architecture of Edinburgh; the broken and varied skyline is very different from the invariable straight-line of cornice in all the other terraces of the new town. If Mr. Gowans would only forego his peculiar notions of detail, and substitute a little carving for the profusion of notches and splays he delights in, his buildings would be less peculiar, but certainly more beautiful.

BUILDING MATERIALS AND THE PROPOSED PAUPER ASYLUMS.

THE question of building upon an extensive scale for the accommodation of pauper lunatics and pauper patients, afflicted with small-pox or fever, is assuming a very prominent and important feature in the social arrangements of the metropolis, under the provisions of the Poor-law Act of 1867. Measures are in progress for the erection of such buildings in various parts of the suburbs of London, the funds being provided by contributions from the several metropolitan parishes and unions, the whole being under the supervision of representatives elected by the several parochial districts, and constituting what is termed the Board of Management of the Metropolitan Asylum District. Sites for the proposed buildings have been already purchased at Leewesden and Caterham, and others are now under consideration for hospital purposes. The Board have already obtained power to borrow 200,000*l.* for the purposes of the two asylums sanctioned, and a much larger sum will no doubt be required before the system which has been thus commenced can be brought into practical operation. In the construction of these extensive buildings, if bricks be used, some 20,000,000 or 30,000,000 will be required for each, in bricks and mortar, consequently the third of the whole expenditure will be incurred. It may not, therefore, be unimportant to review some of the matters which bear a close relation to the subject, and especially those affecting the quality of the materials employed, it being highly necessary that such materials should be of the soundest quality possible, free from any admixture of ingredients which produce deterioration and generate disease.

The Legislature, it may be observed, has already assumed the responsibility of regulating the construction of buildings, by the Act of 18 & 19 Vict., c. 122, well known as the Metropolitan Building Act, 1855; and two amendment Acts, modifying and extending the provisions of the original statute, have since received the sanction of Parliament. These Acts contain provisions relating to the lines of walls, recesses and openings, parapets and bressummers, chimneys and flues, fireplaces and conveyance-pipes for heated air, steam and other products of production; but they make no reference whatever to the character and quality of the materials commonly used in the erection of such buildings. There are no regulations enforceable to insure the structure being perfectly dry in all seasons of the year, which is a very important consideration in this variable climate, and never attained when sea-sand or any material impregnated with saline matter is used in the construction of the building. Many of our public structures give ocular demonstration of inherent defects which due precaution might have prevented. We need only instance the Hanwell viaduct of the Great Western Railway, in elucidation of the point to which we direct attention. This with its mildewy walls indicates a process of absorption and emission going on continually, rendering every part thereof damp. If saline particles be in either bricks or mortar they act like a sponge in absorbing moisture from the atmosphere, and giving it out again under the influence of heat. The new boundary-walls of Coldbath-fields' prison, near to Mount Pleasant, is another instance; and we should not be surprised if the costly erection of St. Thomas's Hospital, now in progress, should in after years awaken posterity to the fact that materials containing saline matter were used in the building. It is now upwards of twenty-five years since the Great Western Railway Viaduct was built, and there it stands, a monument of indiscretion on the part of those by whom it was constructed.

The committee of the Board of Management of the Asylum District, who are entrusted with the selection of sites, the preparing of plans, and the drawing of specifications, very laudably direct their attention to facilities for drainage, salubrity of atmosphere, accessibility by road or railway, and other requisites of an obvious character, which ordinary business men could not overlook without displaying great want of attention; but there are many other considerations well entitled to notice in the formation of such buildings as are contemplated by the Asylum Board. While the Building Acts, as before stated, abound in rules applying to form of construction, they absolutely ignore the quality of building materials; and hence we have private dwellings, public schools, infirmaries and hospitals, workhouses and prisons, built of brick containing saline matter, kept together by means of mortar which has been mixed up with sea-sand or sand taken from the river Thames below Blackwall, where it is generally brackish, and becomes more and more so as we approach Gravesend, where the river flows into the sea. Buildings made in the way we have described never fail to exhibit the ordinary tests of dampness, which, if not recognized by the sensibility of the organs of smell, seldom remain undiscovered by those of vision. The walls of such buildings generally become flakey white outside, and frequently present a similar appearance inside through three or four coats of paint. The observant eye may have noticed blisters of paint upon a "flatted wall," which, if probed with a knife, will let moisture exude and trickle down, showing that it must have come from the material of which the walls are built. The Board-room of the mansion in Spring-gardens, where the Metropolitan Board of Works holds its weekly sittings, and which is at present temporarily occupied by the Asylum District Board, affords a striking proof of the correctness of these remarks.

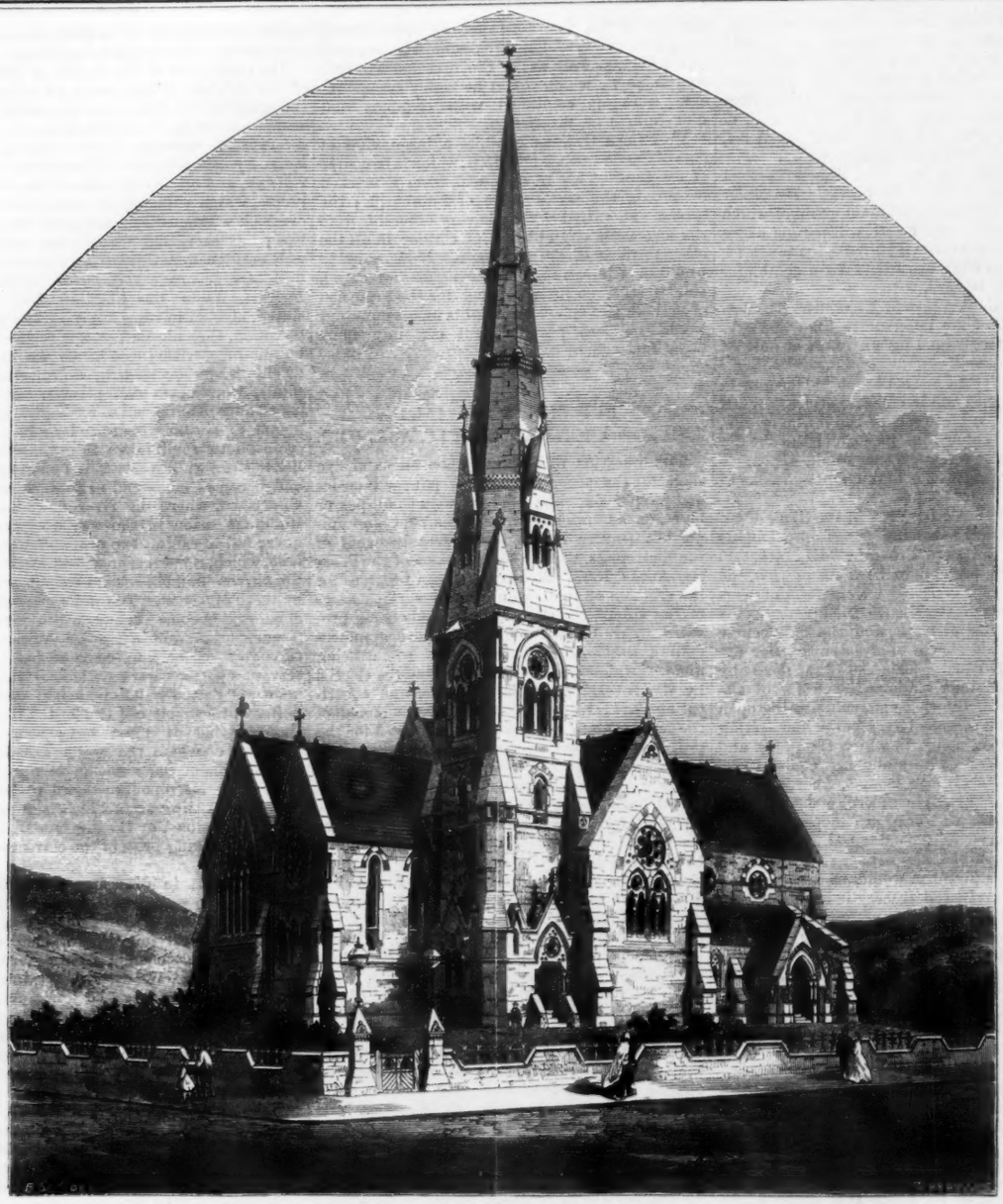
Our object in directing attention to these matters is to obviate, as far as possible, in the construction of buildings projected by the Metropolitan Asylum Board, similar mistakes to those already committed in other large building operations. We believe that, in many cases, builders err through sheer ignorance, and that architects—highly educated professional men—from want of practical attention, have failed to detect the hidden causes which are silently operating in producing the most disastrous results.

The infirmaries of our workhouses, and many of our large hospitals, contain very many patients, labouring under chronic diseases of a painful character, which there is every reason to believe originated from damp pervading the structures, and by consequence the atmosphere of the houses in which they resided. Chronic rheumatism, ague, intermittent fever, and many other affinitive forms of disease, which generally prevail in large establishments, especially when situated in close neighbourhoods, or where the inmates are crowded together as in the dwellings of the poor and working-classes, owe their existence, in a great measure, to the faulty nature of the materials of which the dwellings are constructed; nor do these observations apply only to the houses of the poor; for the rich, whose residences wear a degree of splendour on their exterior, have the same canker-worm of saline damp, eating its way through every part of the structure, and seizing with irresistible force, albeit unobservedly, the physical frames of all who come within the sphere of its pervading influence.

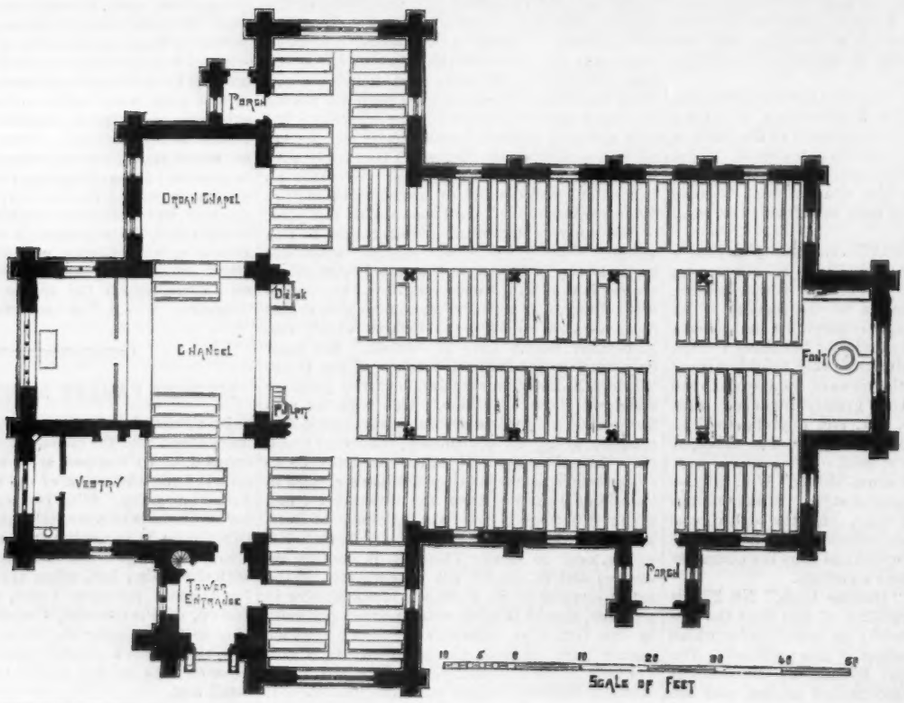
A METROPOLITAN RATEPAYER.

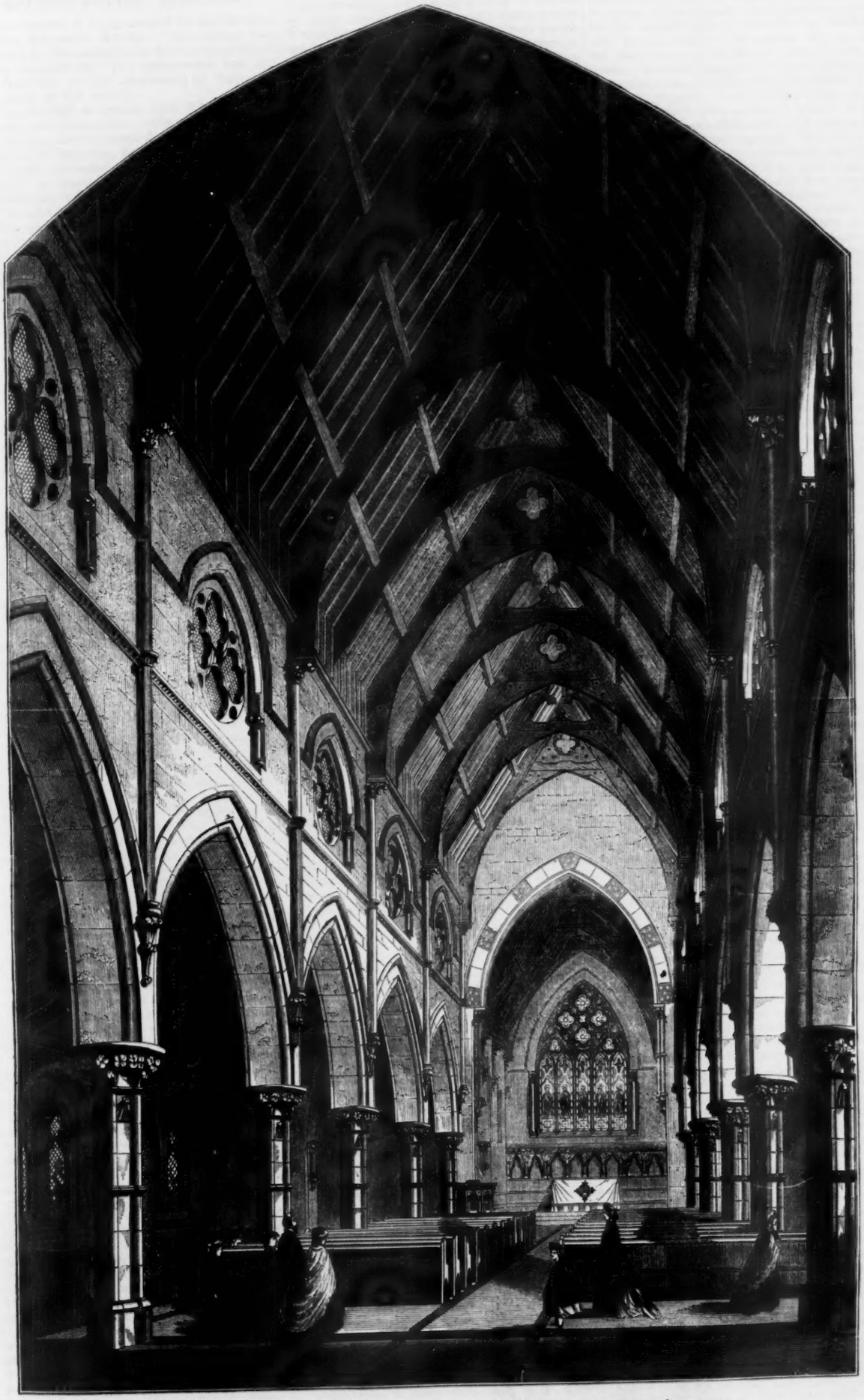
BISHOP'S CAMDEN SANITARY VALVE.

IN thousands of cisterns the "waste pipe" leads direct into the house-drain; and, being untrapped, or so trapped as to be inefficient, permits the contamination of the water by foul and dangerous gases. Who can estimate the number of illnesses to which this has led? The best thing to do is to arrange the waste-pipe so that it may discharge itself without actual connexion with the drain; but, when this cannot be done, the Camden Sanitary Valve, patented by Mr. Bishop, of Pratt-street, Camden Town, may be very usefully employed. It consists of an air-ball, that opens a carefully arranged valve, when the cistern is too full, and it may be applied at small cost.



SHARROW CHURCH, SHEFFIELD.





SHARROW CHURCH, SHEFFIELD.—MR. J. B. MITCHELL-WITHERS, ARCHITECT.

SHARROW CHURCH, SHEFFIELD.

THIS church is being erected by the Sheffield Church Extension Society. The design was selected in open competition from those of about thirty competitors. The corner-stone was laid in June last by the Archbishop of York, the president of the society.

The building is erected with Whirlow wall-stones and Eyam ashlar. The roofs and internal fittings are of stained deal. The contracts, exclusive of warming, lighting, boundary walls, architect's commission, and clerk of works, amount to about 4,200*l*. Accommodation is provided for 750 adults. The site was presented by Sir John Brown.

The east window will be filled with stained glass by Messrs. Clayton & Bell, the gift of Mr. Chas. Gould, and the west will be filled with glass, the gift of another friend.

The church will be ready for consecration in the autumn of the present year.

The architect is Mr. J. B. Mitchell-Withers, of Sheffield.

SONS OF THEIR WORKS.

UNDER this title, "*Les Fils de leurs Œuvres*," Mr. George d'Heilly publishes, this week, at Rouquette's, Paris, a curious little book, in which the origin of a few well-known persons of the present epoch is indicated. We learn from it that About is a grocer's son; Auber, son of a picture-dealer; Belmontel, of a joiner; Coquelin, of a baker; Crosnier, of a porter; Duprez, of a perfumer; Garnier, architect of the new Opera House, Paris (of which an illustration was lately given in the pages of the *Builder*), of a smith; Gevaërt, of a labourer; Gueymard, of a farmer; Halevy, of a grocer; Houssaye, of a miller; Levasseur, of a labourer; Victor Massé, of a dealer in nails; Monselet, of a bookseller. Mademoiselle Rachel is the daughter of a hawker; Rossini, the son of itinerant singers; Scribe, of a silk dealer; and Verdi, of an inn-keeper. All honour to them for their self-creation!

TUBE WELLS.

A NUMBER of gentlemen met on Saturday last in a field near Thames Ditton station, for the purpose of witnessing the sinking of wells upon the tube system, which was used to good purpose in the American war, and is now being used in Abyssinia with success. The utility of this invention, of which Mr. Norton, of Ludgate-hill, is the sole patentee in this country, is not, however, confined to campaigning.

The simple contrivance by which, it would appear, a well may be extemporised in some twenty minutes, is a few pipes about 3 ft. long—like gas pipes—two clamps, and a monkey. The first pipe, which makes the well, is perforated for about 16 in., and is shod with a steel peg top, which swells out beyond the pipe, and which fulfils the double purpose of providing a sharp point and easing from friction whatever lengths of tubing may have to follow it. A clamp is placed about the centre of this tube, and another clamp at the top, to which two pulleys are attached, and over these pulleys a cylindrical "monkey" is suspended, which, falling on the clamp below, drives the pipe into the ground. Then another pipe is screwed on, and the clamps being lifted higher, the same process is continued, and so pipe is added to pipe until the water stratum has been reached, which is ascertained by dropping a plummet into the tubing. Then a small ordinary sucking-pump is screwed on to the last pipe, which is allowed to protrude about a foot above the ground, and water thick with sand immediately comes up at the rate of about ten gallons a minute. After some time all the sand smaller than the perforations below to which the draw of the pump extends is eliminated, and the perforated portion of the pipe rests in a bed of shingle, the pebbles being necessarily small near the pipe, and growing larger in proportion to the distance at which they are removed. Thus a natural filter is formed.

The tube-well which attracted most attention was that which is in use in Abyssinia, the pipes of which are only 1¼ in. in diameter. This well was sunk 15 ft. in 17½ minutes, and water was pumped in 19 minutes. Two men can carry this well, and everything connected with fixing it, and one is quite equal to anything the fixing requires. It was taken up by means of the "monkey," worked upwards, in 7½ minutes, and in the apparently astonishing time of 1½ minute by means of a lever, which a mule easily carries in addition to half a dozen wells. These pumps can be made useful on farms, and in factories, as well as in the premises of private houses. When water does not come it is coaxed, as it were, by driving water down the tubing at a pressure of two or three hundred pounds to the inch, which searches the strata, and makes a water-way. Where the water stratum is sandy a filter of horse-hair is inserted in the tube. The water never freezes.

EARTHQUAKE-PROOF BUILDINGS.

AT a recent meeting of the Scottish Society of Arts, in Edinburgh, Mr. David Stevenson read a paper on certain arrangements, designed for the preservation of structures in countries subject to earthquakes. Mr. Stevenson stated that his attention had been directed to the matter, not as a speculative question, but by the Government, as a problem of practical engineering. The Japanese had applied to the Government of this country to advise them as to what was necessary to light the coast, according to treaty, the difficulty consequent on frequent earthquakes being pointed out. The Board of Trade, in remitting the whole subject to Messrs. Stevenson, specially directed attention to this new feature in lighthouse engineering. Mr. Stevenson explained the device he had proposed for rendering buildings aseismatic, and illustrated it by diagrams and models. The new construction, as described in the *Scotsman*, is based on the principle of breaking the continuity between the earth, which is effected by the shock, and the superstructure which rests on its surface; and the break is effected by the aseismatic joint, which, in the case of lighthouse apparatus, consists in placing the iron table on which the apparatus rests on balls of metal, working in cups [of somewhat larger diameter, we presume, than the balls], formed in the underside of the table. These balls rest in similar cups formed on the upper side of a lower table. When the lower table is affected by a shock, it is at liberty to move freely, without affecting the apparatus above, which, by reason of its inertia, remains unaffected. The motion being *qua qua versal*, also renders its action the same from whatever direction the shock may come. Mr. Stevenson stated that the aseismatic action had been successfully tested by experiments made at Messrs. Milne's works on tables of the full size for a first-order lighthouse. The Government have ordered the whole of the lights about to be constructed here for the Japanese Government to be made on this principle; and it may ultimately be adopted for architectural or domestic arrangements generally in countries subject to earthquakes of destructive character. The Japanese, who are an ingenious, mechanical people, will probably adopt it wherever it is applicable.

PROVINCIAL NEWS.

Brighton.—The foundation stone of a Turkish bath has been laid in West-street. Messrs. Cheesman & Co. are the contractors, and the architect is Mr. Goulby.

Hull.—The west dock, an important addition to the works of the Hull Dock Company, will be opened before the close of the present year. It is expected that the Prince of Wales will attend the opening ceremonial.

Bradford.—The new buildings at the corner of Bank-street, for the Commercial Joint Stock Banking Company, lately carrying on business in Market-street, has been opened. The style is French Gothic. The principal front looks towards the Exchange. It consists of two stories and an attic. A tower rises to a height of about 90 ft. from the corner adjoining the intended new street. The entrance door at the foot is deeply sunk, with polished granite shafts and moulded bands. The windows in the first story of this tower are sunk to a depth of 4 or 5 ft. Each of these windows has a projecting balcony, with balusters, and is surmounted by gablets having carved crockets and finials. The double windows here are also pointed and deeply recessed. A carved cornice and pierced parapet, with angle pinnacles, surmount this story, above which rises a steep slate roof, with dormer windows, terminating in wrought-iron cresting and finials. In this frontage, there are on the ground-floor four windows, with pierced panels underneath, and a door corresponding to that in the tower. These have shafts of polished granite. On the second floor are five double windows, with tracery heads. Throughout the carving has been executed by Messrs. Maw & Ingle, of Leeds. A cornice, supported on carved brackets in couples, runs along the front, and above it is a pierced parapet. A row of single-light stone dormer windows, with gables, is placed in the roof. The frontage to Piece Hall-yard corresponds in detail with that just described. The third side, commencing from the tower previously described, is, with the exception of a large central gable, treated in a similar manner, but is at present almost hidden by the adjacent houses. Mr. A. Mallinson has been clerk of the works, and under his superintendence the designs of the architects, Messrs. Andrews, Son, & Pepper, of this town, have been executed. The masonry was done by J. Burnley & Son; the joiners' work by J. Wilson & Sons; the furniture of the bank by Mills & Backhouse; the plumbing by J. Keighley; the slating by T. Nelson; the plastering by B. Dixon; the painting and decorating by H. Briggs; the cast-iron work by J. Cliff & E. Haley; the ornamental wrought-iron work by W. Slater; and the gasfittings by Skidmore, of Coventry.

Shepton Mallet.—The almshouses have been recently built, and are designed to accommodate four persons. Each comprises a living-room, pantry, and bed-room with a bay-window and porch. There is a separate yard at the back of each house enclosed by a wall, with the necessary outbuildings. The walls are built of the local stone, hammer-dressed on the external face, with Doulting quoins and dressings. The roofs are covered with Bridgwater tiles. The contractor for the masons' work was Mr. Fudge, and for the carpenters' and joiners' work Mr. Stock, both of Shepton Mallet. Mr. Ferrey, of London, was the architect employed.

SANITARY MATTERS.

Liverpool.—At a special meeting of the Health Committee of the Liverpool corporation, it has been decided to recommend the council to apply to Parliament for powers to enforce the conversion of all privies within the borough into water-closets, the cost to be defrayed by the corporation and the respective owners, in proportions afterwards to be decided. It has been satisfactorily shown that the conversion, so far as it has proceeded, has materially reduced the local rate of mortality.

Farnham Sewerage Competition. — A correspondent of the *Surrey Standard* says,—"It is now twelve months since plans were deposited with the local authorities for improving the sanitary state of the town, and, as yet, nothing is known, either by the competitors or the public, respecting the adoption of any of the numerous schemes submitted, agreeably with the advertised desire of the local Board. It appears very desirable that some immediate decision of the Board should be made known, especially so, considering the dangerous sanitary state of the town. An unsewered town, containing nearly 6,000 inhabitants, is certainly a place most likely to be visited by fevers, cholera, and other epidemics: should these fearful visitants arrive during the approaching summer, death must necessarily ensue, and then the authorities will feel they have been guilty of gross neglect and abuse of powers vested in them by Government. It is to be hoped that the local Board will set resolutely to work in improving the present defective sanitary condition of the town. Will you kindly inform us whether the Board is defunct, and what has been done with the various sets of plans?"

Seaford Drainage.—The plan of Messrs. Gotto & Beesley (estimated cost 2,400*l*.), which has been finally adopted, will consist of a main outfall sewer along the front of the town, so as to convey the sewage to the Cliffe and about half a mile to the eastward, and discharge it, after being deodorised, into the sea at low-water mark. At and after low water, the current sets in to the eastward, towards Beachy Head: so that there will be no nuisance to bathers and others in front of the town, the whole being about a mile in extent. At the western extremity a large flushing reservoir will be formed. This will be filled by means of a self-acting iron pipe through the beach, at high water, and as soon as the sewage is emptied at low tide, the con-

tents of this reservoir, about 15,000 gallons, will be flushed through from end to end of the main drain, to keep it clear and free from deposit. Pipe sewers, communicating with the main outfall sewer, are to be laid in all the streets, with special provisions for inspection, cleansing, and ventilating the same, the latter object being attained by charcoal ventilators. There is also to be attached to the main sewer a tank and apparatus for deodorising its contents before its discharge into the sea. Provision will also be made at the outfall for, at a future time, as the town increases, pumping the sewage on the land at a distance from the town for agricultural purposes. The tender of Mr. W. Williams, of Swansea, to do the work for 2,283*l.* was accepted. The plan has been approved of by the Home Secretary, and arrangements made for repayment by rate in thirty years.

Fever at Higham-on-the-Hill.—A correspondent of the *Coventry Herald* states that the fever which prevails at Higham, where there have been sixty cases and six deaths in a population of 500, arises from nuisances on private property in that part of Higham where the fever broke out, and also from overcrowding. A medical report also speaks of bad drainage as one cause; this, however, the writer says, relates chiefly to the private property referred to. Private or not private, the nuisances will surely be abated. Of the cases of fever, it is said, thirty-five occurred within fifty yards of the nuisances.

ASYLUMS FOR THE INSANE POOR, LONDON.

ON the 14th, the Metropolitan Asylum District Board, a body formed by the Poor Law Act of last Session, held a meeting at the Westminster Palace Hotel, for the purpose of considering the designs sent in, as we mentioned last week, by various architects for building an asylum for the insane poor, at Leavesden, Woodside, Herts. The designs were from,—

Messrs. Tolley & Dale (estimated cost), 65,000*l.*; Mr. Wm. Lee, 82,000*l.*; Mr. F. H. Pownall, 108,800*l.*; Mr. A. Wilson, 91,000*l.*; Mr. P. Gordon Smith, 78,800*l.*; Mr. F. Chambers, 96,350*l.*; Mr. John Giles (Giles & Biven), 66,700*l.*; Mr. Thomas Worthington, 94,300*l.*; Mr. Henry Jarvis, 78,000*l.*; Mr. M. P. Manning, 92,000*l.*; and Mr. J. E. Knightley, 125,000*l.*

The first premium of 250*l.* was awarded to Mr. Giles, whose design was estimated at 66,700*l.*; the second premium of 150*l.* to Mr. A. Wilson; and the third (100*l.*) to Mr. F. H. Pownall.

The designs for an asylum at Caterham were referred to the same committee, who have sent in their report. The competitors in this case are Messrs. Giles & Biven, Mr. Knightley, Mr. Andrew Wilson, Messrs. Tolley & Dale, Mr. F. H. Pownall, Mr. Thos. Worthington, Mr. Jarvis, Mr. F. Chambers, and Mr. M. P. Manning.

The committee have recommended to the Board the design submitted by Messrs. Giles & Biven, as in the first case, and it will probably be selected. We have no hesitation in saying, after examination, that the design selected is far superior in several important points to any of the others.

HASLINGDON WORKHOUSE TENDERS.

FROM the report to the local Guardians, of the Building Committee, it appears that there was but one tender for the whole work—that of Mr. J. Barry, of Scarborough: the others, which were very numerous, being from smaller contractors for portions of the work only. The tender of Mr. J. Barry, at the sum of 20,865*l.*, was accepted by the guardians. Several of the guardians expressed surprise at the necessity for the original grant of 13,500*l.* being so largely exceeded; but the architects, Messrs. Lockwood & Mawson, who were both present, explained that all this was mainly due to the increased requirements of the Poor-law Board since the plans were originally decided upon, alterations and additions thereby being rendered compulsory which greatly enhanced the cost. Not long ago, 17*l.* a head on the number of inmates would have been ample to have paid for a well-built workhouse, but now, so stringent had the requirements of the Poor-law Board become, nearly double that amount was necessary if good material and satisfactory workmanship were to be used. A few years back 500 cubic feet of space were allowed for each pauper, but now the Poor-law Board were satisfied with nothing less than 1,500 ft. per head. A large increase in the cost of internal arrangements was entailed by reason of extra staircases, passages, bath-rooms, &c. They also stated that before the plans were drawn they had not been shown the site, and had, therefore, not taken into consideration the cost of taking material thither. However, they were content to accept the 5 per cent. on the original estimate as their remuneration; although, in consequence of the alterations named, it would be far from a profitable undertaking. It was decided that application be made to the Poor-law Board for permission to borrow 15,000*l.* additional. As to payment of the architects, it was resolved that these gentlemen be paid 300*l.* down, on account of expenses already incurred; 150*l.* more when the main building was ready for the roof; and the balance (200*l.*) on the completion of the work—making in all 650*l.*, or 5 per cent. on the amount originally estimated.

COMPETITIONS.

Hereford Lunatic Asylum.—A meeting was held last week of the committee appointed at the last Quarter Sessions to select the plans for the new lunatic asylum for the county and city of Hereford, which it has been determined to erect on the Burlton estate, near the city, consequent on the decision which has been arrived at to dissolve the present union between the counties of Hereford, Monmouth, Brecon, and Radnor, and the city of Hereford. Three architects had been invited to send in designs, viz., Mr. Kempson and Mr. Chick, of Hereford, and Mr. Griffiths, of Stafford. After investigation of the respective plans, and interviews with the architects, the committee selected those of Mr. Griffiths, and they have been forwarded to London for examination by the Commissioners in Lunacy. It is stated that there was not more than 1,000*l.* difference in the estimates of the architects, the highest being 39,000*l.*

Darlington Workhouse.—The second premium was awarded to Mr. G. Styan, not Stanger.

THE "EGYPTIAN HALL" IN THE CITY.

YOUR "Old Correspondent," who sent the interesting "Notes from York," in the number for Feb. 1st, writes in evident ignorance of the meaning of the expression "Egyptian Hall" as an architectural term. He is, however, by no means singular in this: indeed, I have scarcely ever met with any one, however familiar with the science of architecture generally, who could tell me why the "Egyptian Hall" at the "Mansion House" of the City of London has that designation. When the subject is referred to, either in printed descriptions of the building or in conversation, surprise is usually expressed that a building should be so called which is so entirely devoid of the characteristic features of the architecture of Egypt; and various wild suggestions are made to account for the name, which affords no difficulty whatever to a student who has read his Vitruvius,—evidently few enough at the present day.

Any one who will take the trouble to consult Vitruvius, "*De Architectura*," lib. vi., c. 5, § 31, will find two kinds of hall described, the *Corinthian* and the *Egyptian*. The former is stated to have a single row of columns, supporting an architrave and cornice, with a vaulted roof of elliptical form springing from them. The latter, or Egyptian hall, has a second row of columns, one-fourth part less, placed vertically above the lower row, with a decorated flat ceiling supported on the entablature of the upper order. I have never seen the Assembly Rooms at York, and it is at least thirty years since I looked at the engravings in the "*Vitruvius Britannicus*;" so that I cannot say how far the room, in its present condition, corresponds to Vitruvius's description; but my impression is that, as there depicted, it possessed the double tier of columns which is the chief characteristic of an Egyptian hall. Your "Old Correspondent" will doubtless be able to tell us whether the design is still unaltered, or whether, like the Egyptian Hall at the Mansion House, it has lost its upper story, and with it all right to the designation it still bears. As everybody knows, the Mansion House room corresponds exactly to the Corinthian Hall as described by Vitruvius, and few are aware that when originally built it was half as high again as it is now, and had a second tier of three-quarter Composite columns, with oblong windows between, and a flat ceiling. The design, as erected by Dance, may be seen in Campbell's "*Vitruvius Britannicus*," 1767 (I must apologise for my inability to give a more exact reference, writing from old notes), and was evidently drawn in exact accordance with the description given by Vitruvius. I cannot say when this upper story was taken down (it appears in the external view given in Strype's "Stow," 1754), but when I first knew the hall in 1825, the alteration was not very recent. Probably some correspondent connected with the corporation may be able to supply the exact date.

The corresponding upper story which surmounted the Ball-room is fresh in the recollection of many of us. It was demolished somewhere about twenty years ago.

It may not be generally known that the architect of the Mansion House, forgetting the difference between an Italian and an English climate, constructed it originally with an open court in the centre, with colonnades, which had to be traversed by the guests when passing from the long parlour, or dining-room, to the drawing-room. I well remember a lady saying that on one occasion she was powdered with snow in going from one room to the other, on the occasion of a grand civic party.

EDMUND VENABLES.

FIRE-PROOF CONSTRUCTION OF DWELLING-HOUSES.

I WAS attracted by Mr. George Burchett's title to his letter on the fire-proof construction of dwelling-houses to read it reflectively. There is no doubt about it: fire-proof construction is of the greatest importance, not only for dwelling-houses, but for factories and agricultural buildings; nor would the expense in many cases be so much as the ordinary mode of building, and I think in none so high as Mr. Burchett puts it, 25 per cent.

Why do not the class of architects employed on ordinary dwelling-houses give attention to the subject? I believe they have time enough and to spare. Then something might be done to prevent the terrible accidents, loss of life and property, the agony of public feeling, and the call on the public purse as evinced by the heroic conduct, but sad case, of William Lyons recently.

Even when liberal and enlightened employers are found who would not only listen but discuss the question with the architect, and adopt any plan for the better security of their buildings, does the architect put himself out of the way or give himself any trouble to point out the actual cost and the great advantages of fire-proof construction? I fear very seldom.

I am acquainted with many such cases, but with one especially, where on an estate houses intended to let for 60*l.* per annum are being erected without the commonest precaution against fire. With the exception of the outside walls, all the interior divisions, both on the ground and chamber floors, are lath-and-plaster partitions, where even chimney-bars are omitted, and the outside arches, apparently of bricks laid as 9-in. headers, are in reality only half-bricks laid in that way where the reveals for the box shutters to the bay windows are cut away after the brickwork is carried up and where the door linings have the rebates formed by nailing thin strips of wood to plain casings.

> "But whom do I advise the fashion *led*,
> Th' incorrigibly wrong, the deaf, the dead."

In building brick arches for floors, lateral thrust should, of course, be avoided as much as possible, and iron ties sparingly used. Mr. Burchett is right in this respect to recommend bricks perforated vertically.

I am persuaded that we owe the existence of many old buildings in the Midland counties to the practice of forming the floors with gypsum (sulphate of lime), which is a native mineral and easily procured. Reeds instead of laths were used; and the plaster, as it is called, was thoroughly incorporated with them, and so as to embed and cover both sides; the upper side was beaten and trowelled to a polished and smooth surface, almost indestructible. I was born in a large old house erected in 1692, where all the

floors were formed in this way; though, for warmth and modern notions of comfort, some of the floors had been covered with floor-boards. The polish and smoothness of the old plaster-floors remain perfect after a lapse of 176 years; not a crack or flaw is to be seen.

The material used for the Dennett arch is, I believe, gypsum; and spaces of 12 ft. in width may be covered on this plan without any intervening support. The upper surface can be made level and trowelled to a polish, as above described. Such arches are without any lateral thrust, are like a shell, solid and in one piece. When floor-boards are intended to be used, the top surface can be left rough, and the floor-joists are mere fillets, partly inserted and fixed in the fire-proof material. The cost of fire-proof floors on Dennett's plan would be about 4*l.* per square.

When large openings have to be covered, rolled wrought-iron girders are available for dividing the space: these cost about 9*l.* 5*s.* per ton, and they may be laid 8 ft. or 9 ft. apart, the intervening spaces being arched with the fire-proof material.

In the re-construction of Kelham Hall, Nottinghamshire, after the fire, floors of this kind were used throughout by Mr. Scott; and I believe he has employed the same material extensively in the new Government offices and other works.

The plan is preferable to hollow brick arches: is light in weight, exerts no lateral pressure on the walls, and is fire-proof. Provision should be made for the floors at the time of building the walls, and salient courses two bricks in thickness should be formed, the lower projecting *three* and the upper *five* inches from the inner surface of the walls.

The space in height required for the floor is little, if any, greater than where through joists are used, as in ordinary floors.

With respect to agricultural buildings, I made drawings which, accompanied by a model, were sent to the Dublin Exhibition, for a set of farm buildings for the late Mr. E. W. Wilmot, and carried out similar works for the same gentleman, in which all the roofs were formed of hollow brick arches, up to spans of 30 ft. The arches, when finished, were covered with asphalte to carry off the rain-water. The side-walls of the buildings were only 9-inch work. Efficient ventilation was provided by louvre boarding and frame-work along the centre of the arches, and the lateral thrust on the walls was counteracted by the insertion of three-quarter wrought-iron tie-rods (a chord of the arch, in fact), placed at intervals of 8 ft. or 9 ft., passing through wall plates at the springing, and secured with nuts and screws. The height or versed size adopted for the arches was one-quarter of the space.

This mode of construction was both durable and economical, and the buildings were cooler in summer and warmer in winter than those covered with ordinary slated or tiled roofs.

The importance of cheap and improved fire-proof construction for buildings of all kinds must be my apology for troubling you with this letter.

JOHN BLENKARN.

THE DUTIES OF THE BURGH ENGINEER OF EDINBURGH.

SOME weeks ago a correspondent, writing from Edinburgh in the name of certain sufferers from the storms, asked us for some information respecting the duties of the burgh engineer. We are now able to refer him to an opportune publication of Messrs. Blackwood, which consists in fact, of a classification, or rather codification, of the relative clauses of the numerous Acts of Parliament under which the Edinburgh police is administered.*

From this he may learn all that he desires. He will find that it is not only the engineer's duties to see to the repairs of chimney-stalks, chimney-cans, &c., but that he has also most ample powers, as procurator fiscal, in the police court, to prosecute all offenders against the provisions of the several local Acts. This does not coincide with the statement of those duties which our correspondent pointed out in the *Scotsman*; and certainly the official responsibility in the matter should not be allowed to rest on that unsatisfactory footing.

In connexion with this subject we may print the following letter of the Dean of Guild, with regard to the obstruction of masons' sheds on the public streets, regarding which many complaints are constantly made:—

"As Dean of Guild for the time being, I am often applied to about street nuisances, but especially on the vexed subject of masons' sheds. If the gentlemen who so favour me with their correspondence would only attach their names to their complaints, I would satisfy them without the least delay whether the remedy they fondly count upon is within my limited powers or not. When I have nothing more specific than initials to deal with, I cannot answer; and therefore the writers remain for days, or even weeks, under the erroneous impression that I am guilty of a dereliction of public duty.

Masons' sheds are erected on the public streets by warrant and authority of the Paving Board, under their Act of 1862, section 49. When the Edinburgh Provisional Order was obtained, sanguine hopes were cherished that the 81st section of that Act would put a spoke in the wheel of the Paving Board, and take the mason-shed question to a great extent out of their hands; but it was soon found that the powers and privileges of the Paving Board in regard to street nuisances was reserved to them in full force and effect by section 45 of the Provisional Order. Such being the present state of the law, neither the Town Council nor the Dean of Guild Court can do anything to mitigate the evils occasioned by these masons' sheds. Unless some joint measure can be devised between the Paving Board and the Town Council, so as to reduce the nuisance to a minimum of discomfort to the inhabitants, I can see no other way out of our present difficulties. It will never do for the powers that be to attempt an antagonistic policy. That would only add to all the evils so frequently complained of; and as for the masons, they have no mercy,—room and time they will take in their own despotic way.

WILLIAM LAW, D. G."

Here, it would appear, are three different local boards concerned about a very simple matter, and between them the public interest is neglected. Indeed, conflicting jurisdiction seems to be the great bugbear of the Edinburgh local authorities.

THE VENTILATION OF A BALL-ROOM.

IN the newly-acquired house of Mr. E. Ward-Jackson, at Clifton, he has adopted a plan for ventilation, which, on a late occasion, when a large number of persons were gathered together, was found to be very efficacious in letting out all gas effluvia and vitiated air; in reducing very greatly the heat of the room; and in rendering the air both agreeable from its moderated temperature, and sanitary from its quality. It is a plan so practical that it ought to be made known.

The house was lately in the occupation of Bishop Anderson, and of the Bishop of Gloucester and Bristol, and, it may be mentioned by the way, was by them considered as an extremely cold house. This, it may be cursorily said, has been by Mr. Jackson effectually remedied by appliances to the outside and inside of the house, to its windows, doors, and floors, and also, by the introduction into the hall of a large gas-stove, which is said to consume its own products, without the least smell, and to be perfectly innoxious. The heat from this stove is disseminated through the corridors, the rooms, and passages; and, during the very cold easterly gales, with frost and snow, which prevailed in December, the stove was kept slightly burning by night, as well as by day. The sitting-rooms, and all other rooms, preserved their warmth through the night, and were found in the morning exceedingly agreeable. They are all kept throughout at an agreeable temperature, in cold weather, at 56° Fahrenheit, as marked by fourteen thermometers distributed through the house. This temperature may be quickly brought, if desired, to a much higher point. In the bedrooms, where heat is required, it is obtained by a very small gas stove in the room, on the same principle; and each bedroom is provided with a covered opening into the passage, near the ceiling, 10 in. by 5 in., through which any extra heat is carried off. The passages themselves are provided with an air-tight wooden valve to the roof, which can be opened or closed at pleasure by a short wire.

Thus the whole of the house and bedrooms preserve the same even temperature, and in effecting it the consumption of gas is comparatively trifling; the consumption of coals is diminished, and dust is thereby avoided.

But what we chiefly desire to speak of is the ventilation of the drawing-rooms and other sitting-rooms, on the occasion of large numbers of people being assembled. This was effectually proved recently, when Mr. Jackson and his family gave a house-warming, and received about 130 persons.

The plan adopted for thoroughly ventilating these rooms, without *any perceptible draught*, seems to have been based upon the fact, that while heated air always ascends, cold air descends, each offering to the other, at all times, a considerable resisting power, and may be very easily carried out, without much expense. The two drawing-rooms are each 26 ft. long, 16 ft. wide, and 15 ft. high; the dining-room is 29 ft. long, 18 ft. wide, and 15 ft. high. In the drawing-rooms were burning eighteen full gas-lights, and in the dining-room nine.

The plan adopted appears to have been as follows: the centre-piece in the ceiling of each of the drawing and dining rooms was broken through or removed sufficiently to receive a tube of zinc 14 in. long by 10 in. wide (the breadth of the joist), which was inserted at the opening. The two tubes of the drawing-room were then carried between the joists of the room above, to the adjoining wall, where they were united, and were run up along and by the side of the wall to the other room above it, till it reached the roof; not, however, *through* the roof, since a slate or tile roof above it generally contains sufficient apertures through which the heated air can pass. The same also with the dining-room. The zinc tubes in the bedrooms above being afterwards covered with the same room-paper presented no unsightly appearance.

Over the lower part of the tubes in the drawing-room ceiling was placed a *papier-mâché* covering, easily obtainable, five inches from the ceiling, to conceal the opening. In this manner a direct open communication is made from the drawing-room and dining-room through the side tubes to the roof.

To prevent the rush of a down blast of cold air from the roof through the tubes to the rooms below, three points must be attended to. First, a jet of gas, with a small glass door four inches square, must be placed in each bedroom, *inside* the tube, half an hour before the party assemble, so as to warm the tube and produce an upward current.

Secondly, a wooden valve must be formed upon the very top of the large zinc tube under the roof, worked by a wire in the room below it, to be opened and closed, or partially closed, at pleasure. And thirdly, the drawing-room door must be always open (or there must be some other means of admitting air) to allow of the admission of the ordinary atmosphere of the hall into the rooms, and to set the hot air in motion upwards.

A certain proof, beyond the experience of all, as to the agreeable temperature and the sanitary condition of the air in those rooms, was to be found by opening the small glass door in the tube near the roof; when a rush of gas and other fetid air took place of a strongly disagreeable kind.

The plan here described has completely answered the purpose. Several medical men were present, and bore full testimony to it. Something like this has been tried by many before, but seldom, perhaps, so efficiently; a very ample tube being adopted, and carried direct to the roof; remembering that hot air is a body of great dimension, and cannot be compressed within a small compass.

Where a similar arrangement has failed to produce satisfactory effects, it would probably be found that the tubes used were too small. In a new house, of course, the shaft could be formed without even the slight dissight that Mr. Ward Jackson's tube presents in the upper rooms.

BRISTOL.

THE LOGIC OF THE "ARCHITECTURESQUE."

HAVING perused with considerable interest the report of Professor Kerr's lecture on the "Architecturesque," I am desirous of asking a few questions for the further elucidation of his theory.

His general proposition (he must correct me if I misapprehend) appears to be contained in the following extract. The italics are mine:—

"If this be so, let me next try to define what I call the architecturesque. *It is an essence of form and disposition, which (speaking vaguely at first) may be said to make architecture what it is.* . . . . . Architecture is the fine art of the beautiful in building; and as all architecture must therefore be based upon building, I think it plainly follows that there is something which is to be superadded to building, in order to convert building, if the expression be allowable, into architecture. This element it is that I am endeavouring to suggest to your minds." . . . .

* Provisions of the several local Acts regulating the Police of the City of Edinburgh, classified and arranged, with comparative Table, Arrangement of Sections, explanatory Notes, and Index. By James D. Warwick, S.S.C., Town Clerk. Edinburgh, 8vo. pp. 211, William Blackwood & Sons. 1868.

Thus the "architecturesque" is the *essence* of architecture; and it follows naturally as the Professor explains further on, that painting and sculpture, to accord with architecture, must receive "architecturesque" treatment.

So far the theory is clear, but when I read further on, "all this brings me to the great fact, that Mediæval architecture is *all* picturesque," I naturally become confused. Nor are my difficulties lessened when again he states, "I have been for years persisting in this proposition, that all Classic architecture forms one School of Art, and all Mediæval architecture another School of Art,—*the latter picturesque, and the former something not picturesque.* I have called it Classical for want of a better term. But if I am now right, I should call it Architecturesque."

If the *essence* of architecture is the "Architecturesque," *in opposition to the Picturesque*, and Gothic architecture is *all* picturesque, it follows that Gothic architecture, which does not contain the essence, is not architectural at all. If not, what is it? I have carefully gone over all Professor Kerr's reasoning, and find it impossible to get out of this dilemma. It appears to me that he himself is rather confused on the subject. He *feels* something in architecture he cannot quite explain, at least he does not; something that differs from the picturesque, and of which the Parthenon is the present embodiment; but either he covers too much ground with his major proposition, or the minor one relating to Mediæval architecture is too narrow.

Thinking it is better for those who propound theories to support and explain them, I refrain from offering any suggestion for making the "Architecturesque" hypothesis "hold water."

T. M. R.

"THE MAGNET AS A STOVE."

AN instance of the corelation of the physical forces, as existing between magnetism and heat, —more striking, perhaps, than the one you quote under the above heading in the *Builder* of February 29,—is to be found in Professor Tyndall's work, "Heat, a Mode of Motion." The experiment I refer to also disposes of the doubt expressed at the end of the paragraph in your journal, as to whether heat would not be "generated in such a case, whether the apparatus had magnetic power or not."

The experiment may interest some of your readers, and, briefly described, is as follows:—

A small copper cup is filled with an alloy, fusible at a low temperature, and is so arranged that it can be made to rotate with considerable rapidity between the poles of a powerful electro-magnet, without, however, touching either of them. As long as the magnet is not connected with the battery, and is in fact not a magnet, the heat developed by the rapid rotation of the cup is quite insufficient to melt the alloy; but, if the connexion with the battery be completed whilst the cup is in rotation, the alloy soon melts and drops out of the cup.

Another experiment, equally remarkable, is decided in the same work.

A silver medal is suspended in a vertical position by means of a thread, between the poles of the electro-magnet. It is not, of course, attracted by either pole of the magnet, even when the latter is in connexion with the battery. If, the circuit being broken, the medal be caused to spin by twisting the thread, nothing more than the ordinary resistance of the air will be felt; but, when the current is passing, much more resistance will be experienced, as if,—to use Professor Tyndall's own metaphor,—the medal were rotating in some vinous fluid.

H. H. G.

A NUT FOR THE PROFESSION TO CRACK.

THE following extract from a letter addressed to myself by a client of mine, with my reply, may be found worth some consideration:—

"This county is building a lunatic asylum for 30,000*l.* They had a limited competition among three—two local architects and one engineer from ———. When I ask the committee, one by one, 'Why not have a decent architect?' all give the same answer. 'Oh, those fellows run us into such expenses.' Is there not something amiss in the profession, as well as in the justices, for such notions to be so common?"

This is part of my reply:—

"I am sorry to hear the result of the lunatic asylum competition in your county. I myself was some years ago sacrificed to the same notion in another locality; for, although all the magistrates acknowledged that the plans submitted by myself and my late partner in a similar limited competition for X Asylum were by far the best, and though they were exceedingly plain and simple, they chose a most indifferent work by another competitor upon the ground of his not being a professional architect.

The cause, I fear, lies deep in the English mind, in the utter severance of art from the affairs of practical life. So complete is this, that men think that, because architecture has something to do with art, it and its professors are to be avoided whenever it is possible to do without them, especially with buildings of this class; as if planning and scheming to supply the requirements in the best and cheapest manner were not the principal parts of the business of an architect, and as if this could be done better by a non-professional or what they are pleased to term a practical man. * * * *

Certain it is that an architect who knows his business can save far more than he could spend, or would be allowed to spend, in art; and the notion that engineers can build cheaper than architects, is amusing.

Still, it is not to be denied that there may be faults on both sides; but then, while the public run after quacks to avoid architects, they saddle the profession afterwards with the blame due to the incompetence of the very men they themselves have helped to hoist into it." J. P. S.

NORWAY STOVE.

SIR,—I shall feel obliged if any of your readers will inform me how to construct the self-acting stove used by the peasantry of Sweden and Norway, and lately exhibited at the Paris Exhibition, by which a working man may cook a dinner and keep it hot all day. W. S.

LOW ESTIMATES AND HOW CARRIED OUT.

SIR,—Many of your readers, I doubt not, feel somewhat surprised at the great discrepancy in tenders for works which appear weekly in your journal, and any information which would tend to explain or throw some light upon the way in which they are carried out ought and would, I feel assured, be acceptable. Some months since I, amongst others, tendered for the erection of a fire brigade station at St. John's Wood, for the Metropolitan Board of Works, the highest estimate being 2,000*l.*, and the lowest a trifle under 1,650*l.*: the latter was accepted. I paid 10*s.* for plans and specifications, and went through them most carefully, and priced it out to do (as the specification certainly implied) a first-rate job. After providing that the ground should be excavated to a sufficient depth to insure a good foundation, it went on to say that the concrete should be composed of fresh-burnt blue lias ground lime, and clean-washed Thames ballast, in the proportion of one of the former to six of the latter, to be thrown in while hot, well rammed, &c. The job having only been recently commenced, and my business taking me past it very frequently, I was rather curious to see how these instructions would be complied with, when (I confess not very greatly to my surprise) instead of clean-washed Thames ballast being used, a little dirty pit ballast with a great deal of unscreened burnt clay (or ballast if you will) was being used in the foundations, and the brickwork is now being carried up on this substitute for good concrete. Why, sir, only a few weeks since, the surveyor to an adjoining estate detected some speculating builders doing the same thing, when he ordered and insisted that it be taken out, and proper ballast concrete substituted; and yet, in a public building, one that the whole of the metropolitan public have to pay for, it is allowed to remain. I would, in conclusion, ask what inducement can there be for respectable builders to enter into competition jobs with so little chance of success against the "cheap Jacks" of the present day? FAIRPLAY.

BUILDERS' CHARGES FOR TENDERS.

A CASE of considerable interest was tried in the County Court of Gloucester last week:—Jones & Sons *versus* Rees. The plaintiffs are a firm of builders at Gloucester in a large way of business. The defendant is a leading promoter of a Welsh undertaking for the erection of English Congregational churches in South Wales. In June, 1866, a committee, of which Rees was chief acting member, having appointed Mr. Paull, of Manchester, to be architect for the new church to be erected at Swansea, directed him to obtain tenders in limited competition from five firms, including the plaintiffs. Quantities were supplied by the architect. No condition was made as to the lowest or either tender not being accepted. The tender of plaintiffs was the lowest, but being somewhat in excess of the architect's estimate he was authorised to communicate with them with a view to reducing the work. One of the firm consequently went to Manchester, and all particulars were arranged and duly reported upon by the architect to the committee, who, after some delay, wished to enter into a contract with the plaintiffs for the carcasses only of the building. The amount of this having been settled upon and agreed to by plaintiffs, the committee found they had been too sanguine as to obtaining funds, and they desired to proceed with the foundations by day-work under the superintendence of a clerk of works approved by the architect. Plaintiffs demurred to such a course; but, on the desire of the architect, consented to withhold claim for compensation, and accept a fair amount for their time and expenses in their journey to Manchester. The foundations of the church having been completed up to the ground line, the works were suspended till the spring of last year, when the committee found themselves able to enter into a contract for the superstructure. The architect was then commissioned to re-open negotiations with plaintiffs, and ascertain if they would take the work at the rates upon which their original tender was based.

They consented to do so with a few modifications which the architect arranged, and terms of contract were prepared. Plaintiffs were called upon to provide responsible sureties, which they did, and an appointment was made with the architect to meet and settle all details for a contract. This appointment was set aside by a telegram from committee, followed by a letter, stating that "for many reasons" they had decided not to enter into a contract with plaintiffs, and directing the architect to arrange for the work to be carried out by Messrs. Thomas & Co., of Swansea, whose original tender was next in amount above that of the plaintiffs. Whereupon plaintiffs sent in a claim of 35*l.* 14*s.* 9*d.* consisting of the following items:—5*s.* per cent. on the amount of original tender, 14*l.* 4*s.* 9*d.*; expenses to Swansea for local information for preparing tender, 5*l.* 5*s.*; journey to Manchester, 10*l.* 10*s.*; second journey to Swansea in 1867, for further local information, 5*l.* 5*s.* The committee rejected the claim, hence the action by plaintiffs. Mr. Paull gave evidence as to the above, and Mr. Neville, of Abergavenny, and Mr. Jacques and Mr. James, of Gloucester, gave evidence as to fairness of plaintiffs' charges, and cases where demands, under similar circumstances, had been paid to builders for estimates. On behalf of defendant, Mr. Watkins and Mr. Rees, of Swansea, two fellow competitors of plaintiffs in the limited competition, were called to prove that under no circumstances were builders' tenders ever paid; for but Mr. Watkins admitted he should consider he had a claim for compensation in a similar case to this, and would have sued, in one or two instances, in his own experience, if he had known he could recover.

Defendant admitted the item of 10*l.* 10*s.* in plaintiffs' bill, and plaintiffs withdrew the last item of 5*l.* 5*s.* The judge decided for the plaintiffs in the other three items, with costs.

NEW RACE-COURSE FOR MANCHESTER

THE following are lists of the tenders delivered for the grand stand, second-class stands, stabling for eighty horses, fencing, approaches, &c., for the Manchester Race-course Company (Limited). Messrs. Thomas Bird & Son are the architects. Quantities were supplied:—

Grand Stand.			
Cochrane, Parker, & Co.	£6,957	0	0
Terras	6,628	0	0
Greenup & Co.	6,400	0	0
Thompson	6,234	0	0
Neill & Sons	6,215	0	0
Warburton, Brothers	5,850	0	0
Johnson (accepted)	5,489	0	0
Second-class Stands.			
Cochrane, Parker, & Co.	5,073	0	0
Terras	4,856	0	0
Thompson	4,735	0	0
Greenup & Co.	4,700	0	0
Neill & Sons	4,594	0	0
Warburton, Brothers	4,320	0	0
Johnson (accepted)	4,053	0	0
Stabling, Fencing, &c.			
Cochrane, Parker, & Co.	5,150	0	0
Terras	5,084	0	0
Warburton, Brothers	5,020	0	0
Thompson	5,000	0	0
Greenup & Co.	4,980	0	0
Johnson (accepted)	4,940	0	0

THE EMBANKMENT WORKS.

MR. BAZALGETTE, the chief engineer, presented a report as to the progress of the Embankment works at a recent meeting of the Metropolitan Board of Works. We give some extracts from it:—

"*North Side of the Thames.—Thames Embankment between Westminster and Waterloo Bridges.*—The whole of the dams have been completed and removed. The Westminster steamboat pier and 670 ft. of the adjoining river-wall are complete, and a further length of 50 ft. of the latter is constructed to a height of 3¾ ft. above the Trinity high-water mark; 100 ft. of the York-gate substructure, and 390 ft. of the wall adjoining, are also constructed to that height, and a further length of 333 ft. of the latter is complete. The Charing-cross steamboat pier has been brought to levels varying from 4 ft. 4 in. to below 3¼ ft. above Trinity high-water mark, and of the adjoining wall 200 ft. are constructed to 3¾ ft. above high-water mark, and a further length of 196 ft. is complete. The Adelphi landing-stairs are constructed to a height of 3¾ ft. above Trinity *datum:* 50 ft. of the outer capping are fixed, a length of 154 ft. of the river-wall adjoining is constructed to heights varying from 3¾ ft to 5½ ft. above that *datum*, and a further length of 344 ft. of the wall is complete. In the Waterloo steamboat pier the works have been commenced up to levels varying from 1 ft. below to 3¾ ft. above Trinity high-water mark, and the junction with the No. 2 contract has been made. Filling in earth, &c., behind the embankment walls, and in the works generally, has been carried out to the extent of upwards of half a million cubic yards. For the purposes of the Waterloo and Whitehall Railway the lower portion of the Victoria-street and Regent-street sewers from Scotland-yard to the Thames have been diverted, and a part of the railway tube has also been formed. The approximate cost of the whole of the works, including 19,000*l.* for the materials upon the ground, is 443,000*l.*, of which the sum of 5,000*l.* represents the past month's progress.

Contract No. 2, between Waterloo Bridge and Temple Gardens.—The whole length, nearly 2,000 ft. of the river wall, sewer, and subway contained in this contract, is now complete, and the only works remaining to be executed to finish the contract are the laying of about 1,900 ft. super.

of York landings, and the levelling of the surface of the intended roadway. The approximate value of the whole of the works completed is 230,000*l.*, of which the sum of 3,000*l.* is due to the past month's progress.

Abbey-mills Pumping Station.—The buildings and works of this station are actively progressing. The iron work is fixed in its place for a height of 12 ft. The two chimney shafts are, with the exception of the lightning conductors in connexion therewith, complete in every respect. The superintendent's house and the workmen's cottages are all roofed in and slated. The reservoirs for the water supply are near completion; and the tunnel under the northern outfall, for the passage of the water therefrom to the boilers, is steadily proceeding. The approximate value of the whole of the completed works is 171,760*l.*, of which the sum of 3,950*l.* is due to the progress made in the past month.

South Side of the River: Thames Embankment.—Of the 2,370 ft. of dam and staging that had been constructed between Westminster and Lambeth Bridges, a length of 1,100 ft. has been removed, and about 730 ft. of the single pile dam and staging have been constructed above the latter bridge. Within the completed dams a length of about 2,800 ft. of the river wall has been brought to heights varying from 7½ ft. above to 17½ ft. below Trinity high-water mark. The approximate value of the whole of the completed works, including 20,500*l.* for materials upon the ground, is 156,000*l.*, of which the sum of 3,000*l.* is due to the progress made therewith in the past month."

THE DRAINAGE OF GIBRALTAR.

THE new system of drainage works to be carried out by the Sanitary Commissioners of Gibraltar was inaugurated by a public ceremonial on the 20th February; the first stone of the new works having been then laid by Lady Airey, the wife of Sir Richard Airey, the Governor and Commander-in-Chief of the City and Fortress. The cost of the new system is estimated at 35,000*l.* The old town drainage, it is said, was spoilt to improve the defences, the breakwater having led to a great nuisance in connexion with the old drainage. The new system, however, has not been gone into by the Government, nor is it to be entirely at Government cost, the inhabitants having been rated to the extent of 25,000*l.*; but the Imperial Government aid by a subvention.

The *Gibraltar Chronicle*, in reporting the ceremonial, says:—

"There is one statement made in the address of the Sanitary Commissioners to Lady Airey, and referred to in her ladyship's reply, which we would gladly see the subject of further investigation. It is said that the annual death-rate amongst the resident population in Gibraltar is 32 in the 1,000. This, compared with the mortality in England, is certainly a high rate, being equal to that of Liverpool, the worst town, as regards sanitary conditions, of any in England. At the same time, those who have lived many years on the Rock do not share the opinion that the place is unhealthy, nor have we heard that typhus fever or the other forms of illness springing from bad drainage and want of ventilation, are common in Gibraltar.

Doubtless, as in other towns, there is in the poorer quarters overcrowding, inevitable amongst those who have very large families and very small means. It seems, too, that Gibraltar is very deficient in properly constructed dwellings for the poor. In coming to a conclusion as to the healthiness or unhealthiness of the town, the rate of mortality should, we think, be compared rather with the towns of Southern Europe than of England."

The drainage and water-supply works were designed by Mr. Edward Roberts, assistant surveyor of the War Department, under the direction of Major-general Edward Frome, Commanding Royal Engineer. The contractors for their execution are Messrs. A. Kyan & Co., of London.

COURT OF COMMON COUNCIL: BLACKFRIARS BRIDGE, HOLBORN VIADUCT, SMITHFIELD MARKET, &c.

AT a recent Court of Common Council a report was brought up from Mr. Cubitt, the engineer of the new bridge in course of erection at Blackfriars, detailing the progress of the works during the last two months. The works were going on satisfactorily, but the matters relating to the diversion of the Fleet sewer, the connexion with the Thames embankment, and the railway, are in the same state as last year. No coins were found in the old bridge foundations. The new bridge, it is expected, will be opened by the beginning of next year. A report was brought up from Mr. Haywood on the works of the Holborn valley. So far as the carriage thoroughfare is concerned, it is believed that portion of the work will be completed by the end of this year or the beginning of next. The western approach to the viaduct is nearly completed.

A report was brought up from Mr. Horace Jones, the City architect, giving a detailed account of the state of the work at the new market in Smithfield. It appeared that 220 men were at present employed upon the works, and the erection of the different portions of the market was proceeding rapidly. The market would be ready for business to be commenced in it before next Christmas. The following resolution as to markets was agreed to:—

"That to meet the urgent wants of the increasing population, it is expedient that the whole question of market accommodation be at once entered into, more particularly as to vegetable markets, seeing that Covent-garden, the Borough, and Spitalfields are almost inadequate to meet the demands now made upon them, and that it be referred to the Markets Committee to inquire into and report whether additional accommodation is not needed, and whether daily vegetable, meat, and fish markets should not be established for the benefit of the public."

The fish market, it is believed, will ere long be removed from Billingsgate to Smithfield. The Markets Committee have under consideration the question of the enlargement of Farringdon market and the removal of the fish-market.

NOTES IN HOUSE OF COMMONS.

The New Works at Burlington House.—Mr. Layard asked the First Commissioner of Works whether the works to be undertaken on the Piccadilly side of the Burlington House site had been stopped on account of an alleged interference with the rights, or, rather, he should say "lights," of the Albany; and whether, if this were the case, the Royal Academy would be able to complete the building which they have commenced, so as to hold their annual exhibition in it next year.—In reply, Lord J. Manners said that the works had not commenced in consequence of unforeseen difficulties. These difficulties, however, were on the point of being removed.

The Irish Academy.—Mr. Gregory asked the Chief Secretary for Ireland if his attention had been called to the recent operations of the Irish Board of Works at the Royal Irish Academy, and if it were true that the new heating apparatus put into the Academy by the same Board of Works was so dangerous and defective that the two insurance offices in which the structure was previously insured had refused to continue the insurance as before.—The Earl of Mayo said, in reply, that the Irish Government was not responsible for the Irish Board of Works, which was directly under the control of the Treasury. The heating apparatus at the Academy was not new, but it had recently been altered, and the insurance companies objected to the mode of water supply. He believed that the attention of the Chancellor of the Exchequer had been called to the proceedings of the Irish Board of Works generally, and that a careful inquiry would be made.

AMUSEMENTS.

Haymarket Theatre.—The new version of M. Octave Feuillet's "Roman d'un Jeune Homme Pauvre," which has been produced under the supervision of Dr. Westland Marston, and is entitled "A Hero of Romance," is a very interesting play, pointedly written, well put upon the stage, and capitally acted. Mr. Sothern as the Hero, Mr. Buckstone as an old army doctor, Mr. Compton as a dandy man of the world, and Miss Robertson, bear the burden of the piece with ease and finish; and Miss Ione Burke, Mrs. E. Fitzwilliam, and others, materially contribute to the success of the *ensemble*. The former lady, Miss Burke, has a part which, by a little more study and effort, might be rendered even more prominent than it is. We must give Mr. John O'Connor great praise for the scenery. The scene of the second tableau,—the Park of the Château Dumont (Brittany), with the terrace-walls, and the château in the distance; and that of the third,—Ruins of the Tower of Elfen,—are very clever and effective; and the last scene, a *salon*, is furnished with elegance. The piece is a complete success.

Mr. Henry Leslie's Concerts.—The concert on the 12th consisted of songs and glees, set forth by a large number of operants, including Madame Sainton-Dolby, Madame Rudersdorff, Mr. Cummings, and others equally well known. It was a popular evening, and very successful. On the 19th the concert was orchestral and choral, Mendelssohn being in the ascendant.

The Polytechnic.—The attention given by the audience, night after night, to Professor Pepper's excellent lecture on Astronomy, illustrated by spectral analysis, speaks well, both for the ability of the lecturer in rendering even abstruse subjects clear and interesting, and for the advanced intelligence of Polytechnic visitors.

THE RATE-PAYING CLAUSE OF THE REFORM ACT AND THE POORER CLASSES.

GREAT ignorance of the means and habits of the poorer class of tenant householders is manifested in the clause relative to compound householders; otherwise, if not ignorance, there has been reckless indifference, and hundreds of thousands have been wilfully and unjustly *punished*, as it were, because some scores of thousands of the working classes have received a voice in the legislature of the country. No less than 6,000 poor creatures, women no less than men, who can hardly hold body and soul together, in themselves and their children, or a roof above their heads, by sharing it with a crowd of others, were summoned in one day for poor-rates in Hackney parish alone, and by the same rule the poor in every parish in the metropolis must suffer; and not in the metropolis alone, but throughout the whole country. Thus in Salford, a sort of Southwark to Manchester, no fewer than 3,500 summonses for poor-rates were in one week issued, and it is stated that for some time to come the parish overseers will require to have at least 800 issued every week, even after exhausting all possible means for arranging for the payment of the rates by instalments, so low, in many cases, as 6d. a week. It is a fine opportunity for law pickings, and also for the landlords of the poor people who, after paying their rates through these landlords in the form of rent, are now called upon to pay over again to the parish; and, in multitudes of cases, no doubt, for others who had formerly tenanted the houses they now occupy. Such wholesale iniquity and want of consideration for or knowledge of the poor have been the cause of revolutions and of awful bloodshed ere now; and the Government and the Legislature may depend on it that the feeling they are exciting amongst the people is a dangerous one, as the writer of this has himself some cause to know.

DISSENTING CHURCH-BUILDING NEWS.

Bradford.—The chief stone of the new Unitarian Chapel, in Chapel-lane, has been laid on the site of the fabric recently removed. The style of the architecture is Gothic, the accommodation for 500 persons, and the estimated cost 5,000*l.* Messrs. Andrews, Son, & Pepper are the architects.

Walker (Newcastle-on-Tyne).—The chief stone of a building, intended to be used as a Primitive Methodist Chapel and school, has been laid in close proximity to Walker Colliery. The new edifice is to be erected from a plan by Mr. James Robinson, of Gateshead, on ground leased for seventy-five years from the corporation of Newcastle, and is intended to have a classic front with a Grecian pediment. The chapel, with the addition of a rising gallery, will be sufficient to accommodate 300 persons, while the school, under the same roof, is adapted for 150. The whole of the work is contracted for by Mr. Thos. Smith, of Walker, and will be completed for somewhere about 700*l.*

OPENING OF THE MILLWALL DOCKS, ISLE OF DOGS.

THESE new docks have been formally opened for business by the Millwall Docks Company. A large area of marshy ground has been converted to useful purpose by the formation of these docks. The extent of land purchased in the first instance by the Millwall Company was some 204 acres, of which they proposed to appropriate 52 acres to dock accommodation, and 152 acres to wharfs and warehouse accommodation. At present, however, there are only about 33 acres of water. The lock is said to be the largest in London, being 450 ft. long and 80 ft. wide. Its depth of water is 28 ft. in the centre. The sides of the lock vary in section at different points. They are faced with Staffordshire blue bricks to 24 ft. below the top, and have stone copings 1 ft. 6 in. deep, formed of blocks not less than 4 ft. long, well united by stone joggles. For a depth of 6 ft. below the top of the coping the brickwork is 3 ft. thick; then its thickness is increased to 3 ft. 4 in. for a depth of 10 ft.; and then for a further depth of 10 ft. the thickness is made 3 ft. 9 in. Below this the brickwork is thickened to 13 ft., a culvert being

formed in it. The upper part of the wall is backed with concrete, courses of brickwork running back into this concrete to bind the whole together. The lock-gates, which are each 43 ft. wide by 31 ft. high, are box-gates; but the river side of each gate is perforated, so that the water flows freely in or out of the box. The other side of the gate next the dock is, of course, made water-tight. The wet-dock is an extensive basin, which has been constructed in the most modern fashion. The depth of water is 28 ft. on the cill, which will enable vessels of very large tonnage to enter and discharge their cargoes. Around, on the wharfs, there are nine warehouses, and cranes have been erected capable of lifting from 35 cwt. to 15 tons, worked by hydraulic power. Sheer-legs, worked by steam, and of a capacity of 80 tons, are being erected for masting and dismasting, and the shipment and discharge of machinery and other heavy goods. Inside the wet-dock is a dry-dock 413 ft. long, 65 ft. wide at the entrance, and 80 ft. wide in the centre, having a depth of 25 ft. of water on the cill at Trinity high water. Engines and hydraulic machinery have been erected all round the docks, and will be employed in opening the lock-gates, sluices, road-bridges, and cranes. The water by which the vast hydraulic machinery will be worked will be supplied at a pressure of 700 lb. per square inch, by a pair of horizontal engines placed in a suitable building near the graving-dock. The Customs offices, contracted for by Messrs. Mills & Son, are completed. The engines and machinery have been supplied by Messrs. Armstrong & Co.; and the contractors for the whole have been Messrs. Kelk & Aird; the joint engineers being Messrs. Fowler & Wilson.

TRADES UNION FUNDS NOT BEYOND PROTECTION OF THE LAW.

AT the Manchester Assizes, Mr. Justice Lush has delivered a decision of the greatest importance to trade societies. A man named Dodd, the treasurer of the Manchester Operative House Painters' Association, was charged with having embezzled about 800*l.*; nearly the whole of the available funds of the society. The defence set up was, that the association was an illegal one, and that the charge of embezzlement could not therefore be sustained. Mr. Justice Lush decided against this impudent plea; and, in sentencing the prisoner to five years' penal servitude, said that no greater mischief could be caused than by the notion getting abroad that, because a society was a trades' union, it could therefore be plundered with impunity. "Although it had been held that trade societies were not within the protection of the Friendly Societies Act, and, therefore, could not avail themselves of the special remedies given by that Act, they were in no sense illegal societies, and their property, as well as their persons, were as much protected as the property and the persons of any other society."

CHURCH-BUILDING NEWS.

Wentworth.—The rebuilding of the tower, nave, and porch of the church here is now advancing to completion. A considerable amount of work was found desirable to be carried out, more than was originally intended. All the windows had to be replaced by new stone windows. The late Dean Peacock commenced the restoration of the chancel, and such parts left undone are now also being restored; an east window has been fixed, the gift of a gentleman, a friend of the rector. The whole of the works throughout are being carried out by Messrs. Freeman, of Ely.

Carlisle.—At a recent meeting of the St. Mary's New Church Building Committee, the plans of Mr. Christian, the architect, were received, and, with only a trifling alteration, adopted. The style is Decorated, though early. The area of the church will be spacious; and a lofty apse with seven lights forms the east end. The clearstory is lofty, and calculated to throw light well into the side-aisles. The principal entrance is by a porch on the north side, facing Castle-street, while a western door admits from the abbey. It is intended to throw open the whole of the space around the church into the abbey grounds. The general effect of the different religious buildings, mutually supporting each other, will, in the opinion of the architect, be very good.

York.—The Church of St. Mary, Castlegate, has for some years past been in a dilapidated condition, both externally and internally. Its dampness, also, is a considerable drawback to comfort, as are the large box pews, which will only accommodate 260 persons, instead of upwards of 400, as new seating would. The edifice internally will have to undergo a thorough renovation, the outer walls will have to be partially rebuilt, and the top of the spire, which has rather given way, will have to undergo reparation. The expenditure which will be created by all these necessary works, it is thought, will amount to at least 2,000*l.* A meeting of the parishioners has been held in the church to take into consideration the propriety of restoring it. At his own cost, the dean had instructed Mr. Butterfield, of London, to examine the church and prepare plans for its restoration. That had been done, and the plans were before the meeting. The parishioners gave their consent to the proposed restoration, on the understanding that there would be no call upon the rates.

Puddlehinton (*Dorset*).—The church of this parish has been restored, at an estimated cost of 1,050*l.*, from designs by Mr. Ewan Christian, of London, architect. The whole of the works were carried out by Mr. G. I. G. Gregory, of Dorchester, builder.

Kettering.—Warkton Church, which has recently undergone a restoration, has been re-opened for Divine service. A new chancel arch has been inserted; the western gallery has been entirely removed, together with all the fittings in the nave, and oak benches have been substituted. The work has been executed under the direction of Mr. Stephen Brown, of Kettering, builder, from the designs of Mr. Slater, architect.

St. Pancras, London.—Mr. George Moore, of the firm of Copestake, Moore, & Co., of Cheapside, has undertaken to build, at his own cost, a church, parsonage, and schools for a destitute district in the parish of St. Pancras. A site has been obtained near Clarendon-square, Somers-town, and it is expected that the cost will reach at least 12,000*l.*

St. Austell.—At a public meeting it has been resolved that the restoration and re-seating of the parish church be forthwith proceeded with, in accordance with plans and specifications which had been prepared by Mr. H. M. St. Aubyn, architect, and approved of at previous meetings of the Diocesan Society. It has further been resolved that the necessary funds be raised by subscription and other means. About 2,000*l.* will be needed to carry out what is contemplated, of which 1,000*l.* have already been subscribed.

Batheaston.—The parish church of Batheaston has been opened after restoration. A new aisle has been built, the south gallery over the west of the nave has been removed, the tower arch has been thrown open, the church has been re-seated throughout with open benches, and it will be warmed by an apparatus by Mr. Skinner, of Bristol. Gas has been introduced, the standards being supplied by Mr. Singer, of Frome. Mr. F. Preedy, of London, was the architect, and the contractors were Mr. Newman, of Bathford, and Mr. Silver, of Maidenhead.

Newcastle-upon-Tyne.—The church of St. Stephen's, in Scotswood-road, Newcastle, has been consecrated by the Bishop of Durham. The foundation-stone was laid by Sir William Armstrong towards the end of 1866. The church is in the Early Geometrical style of fourteenth century. The church will accommodate 650 persons; 500 in free sittings. The architect was Mr. R. J. Johnston.

Englefield Green (*Windsor*).—The dedication of the north transept, which has been added to St. Jude's Church, Englefield-green, has taken place. The transept has been erected in architectural unity with the edifice. It has a lofty open timber roof, and it is constructed of stone and brick, red, black, white, and orange tinted. At the extreme northern end of the transept is a five-light stained window, which formerly occupied a position nearer the nave. In the western wall is a large circular window, filled with trifoliations in stained glass. The cost of the transept has been 751*l.*, and of this sum 546*l.* had been promised or paid prior to the dedication, leaving a balance of 205*l.* required.

Frampton.—A new reredos has lately been placed in Frampton Church. The design comprises three gablets, carved in Caen stone, over the altar, the central one being a little the highest, flanked by an ornamental arcade on each side. Under the latter is an inlaid diaper formed of bands of white alabaster, incised with black lines and green marble eyes, the ground being a brown mottled alabaster. The portion of the reredos over the altar is lined with Maltese alabaster from Gozo, the central panel having a floriated cross, composed principally of a yellow marble, also from Malta, and resembling gold in colour. The shafts and spandrels of the arcade on each side of the altar are composed of marbles of various tints. The greater part of the inlaid marble and alabaster work was selected by Mr. R. B. Sheridan, M.P., of Frampton Court, when on a recent visit to Malta, and was prepared there. Mr. Earp, of London, carved the ornamental Caen stonework, and also the arcade and diaper work underneath it, and fixed the reredos in its position. The design was prepared by Mr. Ferrey, architect. The reredos is intended as a memorial of a relative of Mr. Sheridan, who has borne the entire expense.

Burn Moor.—The church of St. Barnabas, at Burn Moor, near Fence Houses, has been consecrated by the Bishop of Durham. The foundation-stone of the new church was laid on the 3rd of May, 1867, by the Countess of Durham, the cost of the whole edifice being defrayed by the Earl of Durham. The building is erected at the meeting of four roads from Fence Houses, Sunderland, Chester-le-Street, and Bowes House, and is built in the Early Geometric style, from designs provided by Mr. R. J. Johnson, of the firm of Austin & Johnson, Newcastle. The material used for the walls is variegated bricks, and the same scheme of colours is observed in the roofing.

STAINED GLASS.

York Guildhall.—Another stained-glass window has been added to those already in this Guildhall, representing pictorially the history of the city. The two first, that given by Alderman Meek and that by Mr. Farrer, represent respectively the Roman and Saxon periods, and the present one represents the Plantagenet period, and will form the fourth of the series (the third, the Norman period, not yet being completed, but in progress). The event commemorated is the confirmation of the great Charter in a Parliament held at York, on January 15th, 1298, in the reign of King Edward I. On the left is John de Halton, Bishop of Carlisle, who holds in his hands the Charter, and looks to the representative of the king for his public assent to what has been done. Behind the bishop are Humphrey de Bohun, Earl of Hereford, the Constable, and Roger Bigod, Earl of Norfolk, the Marshal of England. In the centre is John de Warrenne, Earl of Surrey, guardian of Scotland, and lieutenant in the North, who, in the king's name, ratifies the confirmation of the Charters. To the right are the Earls of Gloucester and Arundel, with Henry de Percy representing the Barons. Behind them stand a serjeant-at-law, and a serjeant-at-arms with his mace. This window, as were several of the others in the Guildhall, was designed by Mr. Jas. E. Doyle, author of the "Chronicles of England," and executed by Mr. Wailes, of Newcastle-upon-Tyne. In placing the new window, it is to be hoped it will not be forgotten to restore to its place in the Guildhall the old window which is described by Drake, the historian and antiquarian of York, and in the "History and Description of the Ancient City of York," by William Hargrove, 1818, p. 434, vol. iii. It was the window over the Crown or Lord Mayor's Court, and exhibits some stained glass representing the royal arms in the centre; on the two sides of them the figures of Justice and Mercy; and underneath, the arms of the city, the sword and mace, with the date 1682; executed by Edmund Gyles, an artist resident in York.

SCHOOL-BUILDING NEWS.

Prittlewell.—New schools are in course of erection in this rising place. The building is of Kentish rag-stone, with Bath stone dressings, and there is hardly any work of a merely ornamental nature about it. The architect is Mr. Blake, of Westminster, and the contractor, Mr. Carter, of Rochford. The school-room, which will be divided by a moveable partition, separating the boys' department from that of the girls, is about 50 ft. long by 20 ft. wide, and the class-room is about 18 ft. square. The dwelling-house contains living-room, kitchen, and scullery on the ground-floor, with four bed-rooms above. An under-ground tank receives all the rain-water

from the roof, and is of sufficient size to render any failure in its supplies improbable. The total cost of the building is estimated at 1,500*l.*

Tamworth.—The new Grammar-school building, designed by Messrs. Spragg & Joyce, of Stafford, architects, and now in course of erection, by Mr. C. Clarson, approaches completion.

Bangor.—The chief stone of a new building for the Bangor National Schools has been laid on one of the most desirable sites in the town for the purpose. The spot in question is a triangular piece of land, sloping to the south on its principal frontage, just above the road leading to the Garth Ferry, and below the road leading to Upper Bangor, running on the east side of the Palace grounds. A spot to place the required buildings being thus provided, instructions were given to Messrs. Kennedy & O'Donoghue, of Bangor and London, architects, to prepare the necessary plans and specification, which, after receiving the approval of the Committee of Council, were submitted for tenders by advertisement. The amounts of the tenders received were as follows:—David Roberts, Aber, 2,988*l.*; John Roberts, Chester, 2,950*l.*; John Thomas & Sons, Bangor, 2,863*l.*; W. T. Rogers, Beaumaris, 2,716*l.* 9*s.* 9*d.*; Hugh Rowlands, Carnarvon, 2,654*l.*; Joseph Hughes, Llansantffraid, 2,596*l.*; William Williams, Bangor, 2,579*l.*; Richard Parry, Menai Bridge, 2,546*l.* Mr. Richard Parry's being the lowest tender was consequently accepted by the committee, the architects' estimate being 2,500*l.* The schools will comprise, first, a school-room for 190 boys, 85 ft. 9 in. long by 18 ft. wide, and 16 ft. 6 in. high to the collar beam, with detached class-room 15 ft. by 14 ft., approached by a porch, at the end of which is a lavatory. Second, a school for 190 girls, 64 ft. 9 in. long by 18 ft. wide, and 16 ft. 6 in. to the collar beam, with class-room, porch, and lavatory. Third, a school for 100 infants, 30 ft. long by 20 ft. wide, and 15 ft. 6 in. high to the collar beam, similarly approached, and having the same conveniences as the two school-rooms before described. Fourth, a master's residence, comprising a parlour, kitchen, back kitchen, and three bed-rooms, of the sizes required by Government. There are also playgrounds to each division, a kitchen-yard to the residence, together with a small garden. The front elevation, which faces the city, is a gabled composition, having lancet triplets and other windows, the roof line being broken by smaller gables and dormers over the entrances, windows, &c., and a bell-turret, set off into several stages, forming a central feature. The dressings in front will be of a kind to harmonise with the rubble-work walls, and of brick at the back and less prominent parts. The ventilation is to be on Boyd's principle, and the whole of the desks are to be arranged in groups, divided by curtains. The roofs will be of dressed American timber, lightly stained, the principals being supported on stone corbels.

Books Received.

UNDER the title "Practical Remarks on the Drainage of Land," Mr. W. H. Wheeler, C.E., has issued in a pamphlet form the papers recently published in our pages with his initials. Many may be glad to have them in this more handy shape. —— In the sixteenth volume of the "*Collectanea Antiqua*," Mr. C. Roach Smith has given an interesting and appreciative biographical notice of the late Frederick W. Fairholt, and announces his intention of publishing hereafter in a separate shape Mr. Fairholt's own journal, and completing the biography.——"A Yorkshireman's Trip to Rome in 1866," by W. Smith, jun. (London: Longmans & Co.), is a pleasantly written little record of a pleasant trip, but does not pretend to afford any special information or comment.——"Second-grade Freehand Drawings," designed and adapted by Alfred Copham, of St. John's School, Ladywood, Birmingham (Simpkin & Marshall), comprises fifty graduated outline drawings calculated to exercise the eye and hand.——Mr. Eugene Rimmel has issued, as a prettily little book, "Recollections of the Paris Exhibition of 1867" (Chapman & Hall). It pretends to be nothing more than a surface view; but being illustrated by a number of engravings (principally borrowed from Mr. S. C. Hall's fine catalogue, now in course of publication), it forms an agreeable drawing-room *souvenir* of a great event.

Miscellanea.

FREE LIBRARIES IN LEEDS.—A public meeting has been held in the Leeds townhall, the mayor in the chair, to consider the advisability of adopting the Free Libraries Act in the borough. There was a very determined opposition, principally on the grounds that free libraries were not used by working men, but by a superior class; that the rates in Leeds now amounted to 7*s.* 7*d.* in the pound; and that the present time, with the distress now existing in the town, was inopportune. When the vote was taken, however, the mayor ruled it was in favour of the adoption of the scheme.

THE REGULATION OF RAILWAYS BILL.—The Bill introduced into the House of Lords by the Duke of Richmond is one essentially for the regulation of the conduct of the affairs of railway companies, and will, if adopted by Parliament, establish a supervision calculated to improve railway interests and to protect the public. Companies will be required to publish before each half-yearly meeting uniform accounts, and to give an estimate of the proposed expenditure out of capital for the ensuing half-year. There is a penalty of 50*l.* for falsification of accounts, recoverable against the auditor or other signatory of the company. The Board of Trade is to have power to appoint inspectors to examine into the affairs of a company, and the condition of its undertaking. The Government propose measures to secure the safety of the travelling public. On the other hand, companies are to be protected from extortion in compensation for accidents.

THE CONTRACT SYSTEM IN CALCUTTA.—The Governor-General remarks in connexion with the failure of the new Custom-house sheds in Calcutta, that "the experience of the last few years clearly shows that the system of contracts for large works, as in force in Calcutta, has entirely failed, and there has been a large waste of public money." As regards new buildings, says the *Engineers' Journal* of Calcutta, the system adopted is scarcely a contract system at all: the work is of course superintended by Government engineers, and the materials are all supplied by Government, and it is only the labour that is let by contract. The consequence is that nearly all these contracts are taken by native mistrees, as Europeans cannot compete with natives for labour only. In spite of extra supervision the work of native contractors, as compared with that of respectable European firms, is dilatory and unsatisfactory in the extreme, as any one acquainted with the history of buildings in Calcutta for the last few years can testify. The writer advises the appointment of a committee to inquire into the working of the contract system in Calcutta.

WORCESTER CATHEDRAL RESTORATION: THE NEW REREDOS.—The new reredos, which has been given by the Dean, is nearly completed. The principal portion of the work is in the finest alabaster, varied with marbles and granites of the most choice and rare descriptions, and decorated with gold. In the central portion of the reredos, there is first a height of plain highly-polished alabaster, upon which rest moulded plinths and bases of the same material. These are surmounted by columns of Languedoc and *verd antique* marbles, and of granite, crowned by capitals of carved foliage, forming five niches, the centre and largest of which enshrines a sculptured figure of our Lord, in alabaster of the purest tint, representing him in the act of giving benediction. The figure stands beneath a canopy of inlaid mosaic marbles, Sienna, grayot, and emperor's red. The canopy is completed by a finial in white alabaster, relieved by blue, red, and green marbles. In the niches which support the central shrine on each side are the figures of the four evangelists, Matthew and Mark on the right hand of our Saviour, and John and Luke upon His left. Over the canopies, or rather between the gables in which they terminate, are the heads of the apostles Peter, Paul, James, and Thomas, and over these again is a tier of angels. The gables are completed by carved finials, and the whole is surmounted by an elaborate cresting, above which is a second tier of angels. In the gables on the left are the heads of Moses and David, and on the right the heads of Samuel and Isaiah. The sculpture has been executed from the designs of Mr. Gilbert Scott by Messrs. Farmer & Brindley, of London; and the erection of the reredos has been under the superintendence of Mr. Farrow.

CHARGE FOR TAKING OUT QUANTITIES.—Messrs. André & Hornblower prepared the quantities for the Sefton Park contract, and guaranteed them to the Improvement Committee of the Liverpool town council. Their charge is 1,000*l.* On a motion in the town council for the adoption of the recommendation of the committee, that the council should pay Messrs. André & Hornblower, an amendment was carried, by 34 to 15, that the recommendation should be postponed till the recommendation [of the committee] to confirm the contract with Mr. Campbell was considered.

MEANS OF TECHNICAL INSTRUCTION.—A correspondent writes to the *Manchester Guardian*:—"The rumour is, I believe, perfectly well founded that a munificent friend to popular improvement has offered to give a sum of 100,000*l.* to be devoted to the purpose of promoting technical education. For the present the donor refuses to have any announcement made of his name; but he has taken counsel of some of the persons best qualified to advise him as to the most useful mode of allocating his splendid gift among the communities that are, by their numbers and activity, most likely to turn it to good account."

VITRIFIED CAOUTCHOUC.—In a recent number of the *Moniteur de la Photographie*, it is stated that M. Marion is putting forth a new invention, destined, perhaps, to be of importance to photographers. The new product appears to occupy a position half-way between glass, which is too fragile, and paper, which is too opaque. Its description seems to correspond with one of the forms of the English invention called parkesine. According to M. Lacan, the so-called vitrified caoutchouc has the suppleness of paper and the transparency of glass, without its brittleness. The use to which this transparent film of india-rubber is destined is to receive from the glass negative the film of collodion bearing the photographic image. It can then be put away in a portfolio or box, until it is required to print from it as a negative; so that the most valuable subjects can thus be preserved, packed, or travel without the slightest fear of breakage.

COAGULINE.—This is a new transparent cement, it appears, the production of operative chemists in Stockport. Its adhesiveness and tenacity are said to be extraordinary. Glass, leather, wood, stone, ivory, bone, or minerals can be pieced or joined by it; and so tenacious is it that, when thus used, it will resist a strain of 224 lb. or more. Heat and cold, fire and water, are successfully resisted by it. In piecing glass or crystal with it, its transparency renders the junction imperceptible, and its adhesiveness, in fact, makes the broken glass or crystal as good as new. Its usefulness has led to the introduction of a leather line for window cords, the splice of the cord being joined by the cement, and thus an endless, smooth, and regular band is produced. Its uses are described as being innumerable. The producers (and discoverers, we presume) of this new cement are said to be Messrs. Kay, Brothers, of Stockport, operative chemists.

BRITISH ARCHÆOLOGICAL ASSOCIATION.—At the meeting of the British Archæological Association on Wednesday evening, the 11th, Mr. T. Wright, V.P., in the chair,—a number of forgeries were exhibited by Mr. Cuming, who remarked that two small bronze figures then before the meeting were copies of genuine figures in the possession of two gentlemen present. It was interesting to notice that the fabricators of copies of Indian bells had stilted them in the Roman fashion; and there was a small copy of a Greek bronze vessel, with three feet, such as the Greeks had never put under them. Mr. Roberts said that a remark of Mr. Planché's on the subject of these forgeries was worth repeating. He had said that the ready sale for these things was an evidence that there was a widely extended interest felt in such matters, and should make us hopeful of the future of archæology. Mr. Gunston exhibited a series of knives which had been dug up in Clerkenwell, manufactured in the sixteenth century, some of them of the time of Henry VII., and ranging on to the close of the century. He also showed a very pretty little urn of Samian ware, which had been dug up in Cannon-street about two years since. The discussion on the bronze urn, said to be that of Tanaquilla, was resumed, and further evidence was brought forward, but not sufficient to satisfy some gentlemen present, that the bronze was a genuine antique.

THE DRAWING OF THE THRONE, HOUSE OF LORDS.—We have received a letter from Mr. E. W. Pugin, denying the truth of Mr. Talbot Bury's assertion in our last. We are forced to decline inserting it.

CARBONIZED PAPER.—Mr. J. E. Hover, of Philadelphia, remarks the *New York Tribune*, has invented a new kind of writing and printing paper. The improvement consists in charging the paper with an earthy carbonate. Common writing-ink, of the palest description, when applied to it, becomes intensely black. The mineral surface given to the paper prevents "greasiness," and allows the ink to flow freely. It also takes printing-ink more readily, and produces a black and smooth impression.

LECTURES ON ART BEFORE THE ROYAL DUBLIN SOCIETY.—Professor Macmanus recently lectured on "Sculpture," in the theatre of the Royal Dublin Society House. There was a full attendance. The lecture was illustrated with a collection of plaster casts, placed so as to correspond as nearly as possible to the several epochs in the history of the art of sculpture. Mr. Macmanus commenced by deploring that there is in Dublin no sculpture gallery adequate to the representation of the several stages of development through which sculpture has passed, from its infancy in remote Greek antiquity down to the present day.

ENCROACHMENT ON OPEN SPACES.—Earl Spencer, it is said, has been exciting the ire of the people of Wandsworth by leasing an ornamental lake, of nearly three acres, to an architect or builder, who is about to drain it and build over the site.——It is believed that the negotiations as to the purchase of Sir T. Wilson's rights to Hampstead Heath are *in statu quo*, owing to the price, 8,000*l.* per acre, which had been demanded by Sir Thomas. Further inquiry is to be made on the part of the Marylebone vestry.——It is intended by the owner of Soho Pool, says the *Birmingham Gazette*, to drain the pool, fill it up, and let it out for building purposes. Our authority shares the regret of the people in the vicinity that the only considerable sheet of water in the town should be thus disposed of. The only alternative, he adds, is a public subscription, or a limited company.

DISTRICT EXHIBITION OF ARTS AND MANUFACTURES IN ABERDEEN.—Arrangements are now far advanced for an Arts and Manufactures Exhibition. It is intended that the whole collection exhibited shall be drawn from the northern counties of Scotland, except in respect to the works of native artists and the products of native workmen's skill or ingenuity, which will be sought for wherever they can be procured. Some branches of industry, such as granite cutting and polishing, are almost peculiar to the district, whilst in others, such as shipbuilding, special excellence has been attained. In respect to art, however, and for comparison, works of art and art manufacture not native to the district, or even to the country, will be received. The Queen has consented to patronize the undertaking. The Prince of Wales allows himself to be named president, and the list of its supporters already includes nearly all the nobility and prominent men of all classes in the north of Scotland. It is contemplated that the exhibition will take place in the months of July, August, and September, 1869.

THE METROPOLIS GAS BILL.—The draft of the Bill brought in by Mr. Morrison, Mr. Locke, and Mr. Gorst, to amend the Metropolis Gas Act of 1860, and to make further provision for regulating the supply of gas to the metropolis, and for other purposes connected therewith, has been published. The Bill contains a hundred clauses. By this Bill it is proposed that the Metropolitan Board of Works, or the Commissioners of Sewers, shall have compulsory power to purchase the undertaking of any company (if notice of such intention be given within six months after the passing of the Act), and in case of inability to agree to terms, that question shall be determined by an arbitrator, to be appointed by the Board of Trade, on the application of either party. The price to be charged by the several companies for gas, from the present time to January, 1870, is to be 4s. per 1,000 cubic feet up to the standard of sixteen candles, except in the case of the Independent and the South Metropolitan Companies, which are to charge 3s. 4d.; but after that date the price charged by any company is not to exceed 3s. 9d. The companies may in 1871 appeal for a revision of the scale.

PROPOSED LIVERPOOL FINE-ART GALLERY.—We regret to hear that in consequence of their heavy pecuniary liabilities, the Liverpool town council have resolved to postpone the erection, at a cost of 18,000*l.*, of a Fine-Art Gallery, to which good intent we have before referred.

CHARTER HOUSE SCHOOLS.—The *Guardian* states that the erection of the new buildings for the Charter House School at Godalming has been entrusted to the hands of Mr. Hardwick, architect, and that a governors' meeting will be held immediately to consider his designs.

SAFETY APPARATUS FOR ENTERING FOUL AIR.—M. Galibert's apparatus consists of an air-reservoir, with two tubes attached, the one for the exhaled air extending just within the top of the bag, the other for the air to be inhaled to near the bottom. The outer ends of the tubes are connected with a single mouthpiece, and the person using it secures all the advantages of valves (without the danger which might arise from valves being used and getting out of order), by simply placing his tongue alternately on one or other of the orifices within. Goggles are employed to protect the eyes from irritation, and the nostrils are closed by a small spring clip. M. Galibert's apparatus has been adopted in France by the Ministry of Marine, the Paris Fire Brigade, and by numerous other public bodies and private firms, and it has just been exhibited and tried in London, under the direction of Mr. T. Brown, C.E.

EDUCATION WANTED TO INFLUENCE TRADES UNIONS, AND TO MEET FOREIGN COMPETITION.—Two working men have just delivered public addresses in Birmingham, according to *Aris's Gazette*. One was Mr. Robert Applegarth, the able secretary to the Amalgamated Society of Operative Carpenters and Joiners; the other, Mr. Hibbs, one of the artisans who went in a representative character to the Paris Exhibition. The former treated on Trades Unions; the latter on Foreign Competition with English Trade. Different as these topics may appear, they led the two speakers to one and the same conclusion. Mr. Applegarth wound up his speech with saying that the great want of the working classes was an efficient system of non-sectarian education; while Mr. Hibbs said, what they had to do was to throw themselves with all their might into that new movement for education, not committing themselves to any scheme until they had well pondered over it. Let them at least resolve that their children—the future artisans of England—should be better educated than themselves.

TENDERS.

For alteration and addition to Mr. Cartland's premises, Roman-road, Old Ford. Mr. Iron, architect:—

Dean (accepted)	£260 0 0

For the renovation and repair of the Parish Church of Avelon Gifford, Devon. Mr. Henry Elliott, architect:—

Matcham	£3,709 0 0
Stevenson & Crocker	3,159 0 0
Call & Pethick	2,644 0 0
Condy, Brothers	2,440 0 0
Elliott	2,397 0 0
Bone & Son	2,380 0 0
Ruth & Sons, and Chas. Ruth, jun.	2,341 0 0
Steer	2,341 16 8
Hannaford & Luckraft	2,170 0 0
Willcocks	1,997 0 0

For band-room and training kitchen at the St. Marylebone Parochial Schools, Southall. Mr. H. Saxon Snell, architect:—

Harding	£835 0 0
Till	817 0 0
Rustace	798 0 0
Keys	795 0 0
Manley & Rogers	790 0 0
Wardle & Baker	770 0 0
Gibson, Brothers	745 0 0
Brown (accepted)	732 15 0

For new wing and stable buildings to Urmston Lodge, Wimbledon, for Mr. Frederick Thompson. Mr. J. H. Good, architect. Quantities supplied by Mr. L. C. Riddett:—

Nicholson	£2,670 0 0
Barton & Moreland	2,626 0 0
Colls & Sons	2,342 0 0
Aviss & Son	2,316 0 0
Webb & Son	2,300 0 0
Adamson & Son	2,270 0 0

For the erection of Wesleyan Sunday School premises, George-yard, Hull. Mr. W. Botterill, architect. Quantities not supplied:—

Steele & Darneley	£1,225 0 0
Halls	1,190 0 0
Barrett	1,173 12 0
Reynard	1,152 8 0
Waller	1,130 0 0
Marshall	1,108 15 0
Brown	1,031 0 0
Habbershaw	1,004 8 0
Hutchinson	1,000 0 0
Jackson (accepted)	993 5 0

For John's-place School (St. Philip's), Stepney, for Mr. E. Denison. Mr. Iron, architect:—

Goodman	£390 0 0
Larke	370 0 0
Smith	365 0 0
Page	335 0 0
Brown	334 0 0
A. & J. Smith	325 0 0
Johnstone (accepted)	307 0 0

For new shop-fronts for Longuehays & Co., Commercial-road. Mr. W. Smith, architect:—

Including Plate-glass.

Crabb & Vaughan	£848 0 0

Excluding Plate-glass.

Sabey	519 0 0
Eaton & Chapman	475 0 0
Ennor	467 0 0
Earle	425 0 0

For alterations and additions at 222, Upper-street, Islington. Mr. W. Smith, architect:—

Crabb & Vaughan	£390 0 0
Bradly	363 0 0
Peak	355 0 0
Sabey	350 0 0
Eaton & Chapman	320 0 0

For erecting dwelling-house and rebuilding stables at Buck-street, Camden-town, for Mr. Barrow. Mr. R. W. Hart, architect:—

Langmead & Way	£650 0 0
Tanner	650 0 0
Lawrence & Baugh	645 0 0
Catchpole & Cooper	592 0 0
Kelly, Brothers	547 0 0

For Congregational Church, Exeter. Mr. John Tarring, architect. Quantities supplied:—

	General Estimate.	Spire in Bath Stone.
Inch	£9,836 10 0	£3,157 0 0
Perram	6,561 12 8	297 10 0
Call & Pethick	5,544 0 0	230 0 0
Moass & Sons	5,540 0 0	140 0 0
Kenshole	5,450 0 0	110 0 0
Force	5,229 0 0	40 0 0
Luscombe	5,150 0 0	10 0 0
Tozer	5,085 0 0	...
Stephens & Son	4,442 13 2	150 0 0
Pollard & Son	4,400 0 0	...
Bragg & Dyer *	4,278 5 0	80 0 0

* Accepted.

[This is an interesting specimen of estimating certainly; remembering especially that the differences are produced by the prices alone, the "quantities" having been supplied.]

For alterations and additions to the Sussex County Prison, Lewes. Mr. Henry Card, county surveyor. Quantities by Mr. B. H. Nunn:—

Perigoe	£16,154 8 0
Nutt & Co.	14,400 0 0
Williams	13,378 6 2
Patman & Fotheringham	13,285 0 0
Henshaw	12,778 0 0
Hughes	12,560 0 0
Nightingale	12,352 0 0
Berry	12,110 0 0
Kirk	11,990 0 0
Howell	11,715 0 0
Hall	11,445 0 0
Cheeseman & Co.	10,900 0 0
Chappell	10,690 0 0
Perry, jun.	10,444 0 0

[We understand that the quantities used by the top seven contractors were provided by one surveyor, and those used by the following seven were furnished by another!]

For the enlargement of the Port of Hull Society's Sailors' Orphan Home, Park-street, Hull. Mr. W. Botterill, architect. Quantities not supplied:—

Hutchinson	£3,405 0 0
Barritt	3,317 9 0
Clarkson	3,283 0 0
Jackson	3,236 0 0
Habbershaw	3,220 0 0
Sergeant	3,177 0 0
Marshall	3,146 0 0
Halls (accepted)	3,081 0 0

For the erection of five pairs of semi-detached residences at New Malden, Surrey. Mr. W. Sim, architect:—

Kelly	£5,850 0 0

For a public-house, with cottage and shop adjoining, at Clewer, Berks. With power to use certain old materials on the ground. Mr. W. Sim, architect:—

Gray	£690 0 0

For additions to Bull's Cross National Schools, Enfield. Mr. Thomas J. Hill, architect:—

Rivett	£563 0 0
Bayes	520 0 0
Field & Sons	512 0 0
Patman, Brothers	508 0 0

For the erection of warehouse, Whitecross-street. Mr. T. C. Clarke, architect:—

Killby	£1,782 0 0
Turner & Sons	1,772 0 0
Conder	1,695 0 0
King & Sons	1,690 0 0
Abraham	1,635 0 0
Mortar	1,627 0 0
Webb & Sons	1,596 0 0
Kelley	1,572 0 0
Scrivener & White	1,476 0 0
Henshaw	1,439 0 0

For alterations and additions to No. 23, Pembridge-gardens, Notting-hill, for Mr. P. P. Gordon. Mr. John Taylor, architect:—

Corry	£408 10 0
Higgs	473 0 0
Clement	419 0 0
Lathey, Brothers	418 0 0
Stoner	398 0 0
Killby	389 0 0